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FERN ALLIES

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BAKER







D. H. Scott.

Nov. 29. 1894

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HANDBOOK OF THE FERN-ALLIES.

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# HANDBOOK

OF

## THE FERN-ALLIES:

A Synopsis of the Genera and Species  
of the Natural Orders

EQUISETACEÆ		SELAGINELLACEÆ
LYCOPODIACEÆ		RHIZOCARPEÆ

BY

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FIRST-ASSISTANT IN THE HERBARIUM OF THE ROYAL GARDENS, KEW.



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GOVERNMENT



## PREFACE.

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THE present Handbook is planned upon the same lines as Hooker & Baker's 'Synopsis Filicum,' and the two, taken in connection, cover the whole series of the Vascular Cryptogamia. Since the second edition of 'Synopsis Filicum' was published, upwards of 700 new species of ferns have been described. No doubt many of these, if carefully compared with types previously described, would have to rank as varieties or synonyms. I have just furnished a copy of my list of them to Dr. Lorenzo Yates, of Santa Barbara, California, who wishes to publish a catalogue of ferns, brought up to the present date.

I have not attempted to deal in any way with the fossil types of the orders here included, a study of which, however, is quite needful to understand their relations to one another and other plants. These have recently been fully dealt with by Professor Williamson, in a series of papers in the 'Philosophical Transactions of the Royal Society,' beginning with the year 1871; and the student will find an excellent brief general summary of what is known about them in the translation, just issued from the Clarendon Press at Oxford, of Goebel's amplication of the systematic portion of Sach's 'Textbook.'

J. G. BAKER.

KEW HERBARIUM,  
*May, 1887.*





# HANDBOOK OF THE FERN-ALLIES.

## Order 2.—EQUISETACEÆ.

*Sporangia* all alike, oblong, dehiscing down the inner face, placed 6-9 in a single row round the under side of the margin of stalked peltate receptacles, which are arranged in cones at the end of the stems. *Spores* very numerous, free, smooth, globose, furnished with four hygroscopic filaments, clubbed at the end, which curl round them spirally, falling to the ground and developing usually dioicous lobed prothallia. *Antheridia* placed at the tip of the lobes, archegonia on the fleshy upper surface near the base of the prothallia. *Rhizome* wide-creeping, hypogæous, articulated and sheathed at the nodes, often branched and producing tubercles. *Stems* erect, cylindrical, with a distinct central hollow, which is closed over at the nodes, distinctly ribbed, with air-cells in their walls beneath the ribs, the cuticle abounding in silica, distinctly jointed at each node, and furnished with a sheath, which has as many teeth as the stem has ribs, usually homomorphic, more rarely more or less decidedly dimorphic (barren and fertile different), often furnished with branches arranged in regular whorls, originating from the base of the sheaths. Proper *leaves* entirely absent. *Vernation* not circinate. *Spikes* obtuse or pointed.

EQUISETUM Linn. (The only genus.)\*

### CLAVIS.

Subgenus EQUISETUM proper. Spikes obtuse. Stomata with their aperture on the level of the epidermis.

- |   |          |
|---|----------|
| Barren and fertile stems very different, the latter vernal,<br>fugacious . . . . .                              | Sp. 1-2. |
| Barren and fertile stems different, the latter subpersis-<br>tent and developing small branches in whorls . . . | Sp. 3-4. |
| Barren and fertile stems alike . . . . .  | Sp. 5-9. |

\* For further information see Milde's elaborate Monograph in vol. xxxii. part 2 (1867) of Nova Acta of the Imperial Leopoldino-Caroline Academy Naturæ Curiosorum, which contains figures, with full dissections, of all the known species, and an abstract of it in Milde's 'Filices Europææ,' pp. 209-249; also Duval-Jouve's Hist. Nat. des Equisetums de France (4to, Paris, 1864, 296 pages, 10 plates), and for the fossil-types a paper by Carruthers in Seemann's 'Journal of Botany,' vol. v. (1867), p. 349, tab. 70; Newman's 'History of British Ferns,' Hooker's 'British Ferns,' and the 3rd edition of 'English Botany,' contain figures of all the British species.

Subgenus HIPPOCHETE. Spikes apiculate. Stomata with their aperture immersed beneath the epidermis.

Branches many, regularly whorled . . . . .	Sp. 10-11.
Branches few irregular . . . . .	Sp. 12-14.
Branches none . . . . .	Sp. 15-20.

### Subgenus EUISETUM PROPER.

1. *E. ARVENSE* Linn. Sp. edit. ii. 1516; Milde, Mon. t. 1-3; Hook. Brit. Ferns, t. 60; Engl. Bot. edit. iii. t. 1809. — Barren and fertile stems entirely different. Barren stem æstival,  $\frac{1}{8}$ – $\frac{1}{6}$  in. diam., 1-2 ft. long, with 6-15 ribs and a small central hollow, usually caudate; sheaths loose,  $\frac{1}{4}$  in. long, their ribs distinctly grooved; teeth lanceolate, black, with a white membranous edge; branches regular, densely whorled, solid, tetragonous, usually simple. Fertile stem vernal, fugacious; sheaths distant, an inch long, brown, membranous; spike peduncled, obtuse, 1-1 $\frac{1}{4}$  in. long.

Hab. North temperate and arctic zones of both hemispheres. *E. campestre* C. F. Schultz is a form with a compound æstival stem, ending in a spike.

2. *E. MAXIMUM* Lam. Fl. Franc. i. 7; Engl. Bot. edit. iii. t. 1888. *E. Telmateia* Ehrh.; Milde, Mon. t. 4-6; Hook. Brit. Ferns, t. 58. *E. fluviale* Smith, non Linn. *E. eburneum* Roth. — Barren and fertile stems entirely different. Barren stem æstival,  $\frac{1}{3}$ – $\frac{1}{2}$  in. diam., sometimes 6-8 ft. long, with 20-40 ribs and a large central hollow; sheaths adpressed,  $\frac{1}{2}$  in. long; teeth brown, lanceolate acuminate; branches regular, simple, solid, densely whorled. Fertile stem vernal, fugacious, 1-1 $\frac{1}{2}$  ft. long; sheaths very loose, above an inch long; spike peduncled, obtuse, 2-3 in. long.

Hab. North temperate zone of both hemispheres. *E. eburneum* Schreb. (*E. rivulare* Scheele) is a form with a compound æstival stem, ending in a spike.

3. *E. SILVATICUM* Linn. Sp. edit. ii. 1516; Milde, Mon. t. 9-10; Hook. Brit. Ferns, t. 61; Eng. Bot. edit. iii. t. 1801. — Barren and fertile stems different. Barren stem slender, 1-2 ft. long, with 12-18 prominent scabrous ribs and a moderately large central hollow, not caudate; sheaths about  $\frac{1}{2}$  in. long, rather loose; teeth brown, membranous, lanceolate; branches regular, densely whorled, very slender, copiously compound, 2-6 in. long. Fertile stem  $\frac{1}{2}$ –1 ft. long, sending out whorls of short simple or compound branches from the upper nodes; sheaths very loose,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long; spike obtuse,  $\frac{3}{4}$ –1 in. long, distinctly peduncled.

Hab. North temperate and arctic zones of both hemispheres.

4. *E. PRATENSE* Ehrh. in Hanov. Mag. 1784, 138; Milde, Mon. t. 7, 8; Eng. Bot. iii. t. 1890. *E. umbrosum* Meyer; Hook. Brit. Ferns, t. 59. *E. Drummondii* Hook. — Barren and fertile stems different. Barren stem 1-1 $\frac{1}{2}$  ft. long,  $\frac{1}{8}$ – $\frac{1}{6}$  in. diam., with 12-20 distinct ribs and a small central hollow, not caudate; sheaths loose,  $\frac{1}{4}$  in. long; teeth lanceolate, with a brown midrib and pale edge; branches copious, regular, densely whorled, simple; lower usually spreading or decurved. Fertile stem  $\frac{1}{2}$  ft. long, simple or sending out a few whorls of short branches; sheaths loose,  $\frac{1}{2}$  in.

long; teeth much larger; spike oblong, obtuse, peduncled, 1 in. long.

Hab. North temperate and arctic zones of both hemispheres.

5. *E. PALUSTRE* Linn. Sp. edit. ii. 1516; Milde, Mon. t. 13-14; Hook. Brit. Ferns, t. 63; Eng. Bot. edit. iii. t. 1892. *E. tuberosum* DC. — Barren and fertile stems alike, 1-2 ft. long, with a small central hollow and 6-12 square grooved ribs; sheaths loose,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long; teeth lanceolate, dark brown, with a pale edge; branches copious and regularly whorled in the typical form, ascending, 4-6-angled, hollow; spike dense, oblong, obtuse,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, distinctly peduncled.

Hab. North temperate and arctic zones of both hemispheres; rare in South Europe. Var. *polystachyum* Vill., with the branches ending in spikes, occurs frequently; and a similar form is found in several other species. Alpine forms are slender, simple, or sparsely irregularly branched.

6. *E. DIFFUSUM* D. Don, Prodr. Fl. Nep. 19; Milde, Mon. t. 11. *E. scoparium*, *lave*, and *bicarinatum* Wall. — Barren and fertile stems alike, 1-2 ft. long, with a small central hollow and 6-12 square grooved ribs; sheaths loose,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long; ribs very distinctly grooved; teeth linear or lanceolate, brown or green, distinctly keeled; branches in the typical form copious and densely whorled, ascending, solid; spike oblong-cylindrical, obtuse, 1-2 in. long, shortly peduncled.

Hab. Central and Eastern Himalayas; Kumaon to Manipur, 3000-7000 ft. Nearest *E. palustre*, from which it differs in its sheaths and spikes. It has similar *polystachyum* and alpine forms.

7. *E. BOGOTENSE* H. B. K. Nov. Gen. i. 42; Milde, Mon. t. 12. *E. stipulaceum* Vauch. *E. flagelliferum* Kunze. *E. chilense* Presl. *E. quitense* Fée. — Barren and fertile stems alike, very slender, often decumbent,  $\frac{1}{2}$ -1 $\frac{1}{2}$  ft. long, with a small central hollow and 4-9 square ribs; sheaths loose,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long; ribs distinctly grooved; teeth short, deltoid, brown, membranous; branches fewer than in *palustre* and *debile*, 4-5-angled, solid, often absent; spike oblong, obtuse, peduncled,  $\frac{1}{4}$ - $\frac{3}{4}$  in. long.

Hab. Along the Andes from Venezuela to Chili, ascending to 10,000 ft. on Pichincha. British Guiana, *Appun*! Less compound than *palustre*, with different sheath-ribs, and much shorter membranous teeth. The locality of Jamaica, given by Milde, is a mistake.

8. *E. LITTORALE* Kuhlw. in Ruprecht Beitr. iv. 91; Milde, Mon. t. 17-18. *E. inundatum* Lasch. *E. Kochianum* Bockel. *E. arvensilimosum* Lasch. — Barren and fertile stems alike, 1-3 ft. long, caudate, with a large central hollow and 6-16 prominent ribs; sheaths loose,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long; ribs distinctly grooved; teeth lanceolate, black, rigid; branches often copious, densely whorled, simple, ascending; spike dense, oblong, obtuse, sessile or shortly peduncled,  $\frac{1}{2}$ -1 in. long; spores generally without elaters.

Hab. Russia, Scandinavia, Austria, Germany, France, and discovered recently in Surrey by Mr. W. H. Beeby. The locality of Canada, given by Milde, needs confirmation. Intermediate in general habit between *palustre* and the *fluviatile* form of *limosum*.



9. *E. LIMOSUM* Linn. Sp. edit. ii. 1517; Milde, Mon. t. 15-16; Hook. Brit. Ferns, t. 82; Eng. Bot. edit. iii. t. 1893. *E. Heleocharis* Ehrh. — Barren and fertile stems alike, erect, 2-3 ft. long,  $\frac{1}{4}$ - $\frac{1}{3}$  in. diam., with a large central hollow and 10-30 narrow smooth ribs with broad valliculæ; sheaths rather loose,  $\frac{1}{4}$ - $\frac{1}{3}$  in. long, with distinct triquetrous ribs and rigid lanceolate black teeth; branches absent in the typical form; spike dense, oblong, obtuse,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, nearly sessile.

Var. *E. fluviatile* Linn., non Smith. — Many upper nodes furnished with dense whorls of short ascending simple hollow branches.

Hab. Ponds and lakes of the north temperate and arctic zones of both hemispheres.

### Subgenus HIPPOCHETE Milde.

10. *E. GIGANTEUM* Linn. Sp. edit. ii. 1517; Milde, Mon. t. 31; Gard. Chron. 1883, vol. ii. t. 36. *E. ramosissimum* H. B. K., non Desf. *E. caracasana* DC. *E. Humboldtii* Poir. *E. Martii* Milde, Mon. t. 20. *E. pyramidale* Goldm.; Milde, Mon. t. 22. *E. myriocharitum* C. & S.; Milde, Mon. t. 27. *E. mexicanum* Milde, Mon. t. 28. *E. Schaffneri* Milde, Mon. t. 23. *E. scandens* Remy. — Barren and fertile stems alike, erect or subscandent, usually 6-8 ft. long, but reaching 20-40 ft.,  $\frac{1}{2}$ -1 in. diam. low down, with 20-50 narrow square scabrous ribs with a ridge down the keel and distinct spaces between them; sheaths tight,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long; ribs square, scabrous, with hardly any valliculæ between them; teeth linear,  $\frac{1}{5}$ - $\frac{1}{4}$  in. long, black or brown, with or without a pale margin, rigid, deciduous; branches copious, elongated, densely whorled, with 6-8 scabrous ribs; spikes dense, oblong, apiculate, black, subsessile.

Hab. Marshes of Tropical America from Mexico and Cuba southward to Buenos Ayres and Chili, ascending to 5000 ft. in New Granada. Here I fail to draw any distinct line between several of Milde's species. Both in this and the next the branches often end in small spikes.

11. *E. XYLOCHÆTUM* Metten. Fil. Lechl. ii. 34; Milde, Mon. t. 19. *E. giganteum* Hook. 2 Cent. Ferns, t. 74. *E. Lechleri* Milde. — Barren and fertile stems alike, erect, reaching a height of 10 ft.,  $\frac{1}{3}$ -1 in. diam., with a large central hollow and 30-40 smooth square ribs, so crowded as not to leave any distinct valliculæ; sheaths tight,  $\frac{3}{4}$ -1 $\frac{1}{4}$  in. long; ribs square, with very narrow valliculæ; teeth linear, rigid, black, deciduous,  $\frac{1}{3}$ - $\frac{1}{2}$  in. long; branches copious, densely whorled, usually simple, with 6-8 triquetrous scabrous ribs; spike dense, black, oblong, subsessile, apiculate.

Hab. Peru, near Arica, Lechler 1556! Lima, Gaudichaud. Chili, Besser, Closely allied to *E. giganteum*.

12. *E. RAMOSISSIMUM* Desf. Fl. Atlan. ii. 398; Milde, Mon. t. 24; *E. elongatum* H. B. K. *E. campanulatum* Poir. *E. panicum* Kit. *E. incanum* Vauch. *E. ramosum* Schleich. *E. ephedroides* and *pallidum* Bory. — Barren and fertile stems alike, 1-4 ft. long, with a large central hollow, simple or irregularly branched, varying from  $\frac{1}{2}$  lin. diam. with 4-6 ribs to  $\frac{1}{8}$ - $\frac{1}{3}$  in. diam. with 20-25 ribs; ribs prominent, narrow, very scabrous; sheaths

rather loose,  $\frac{1}{4}$ – $\frac{3}{4}$  in. long, their ribs margined with a distinct line on each side; teeth  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, lanceolate acuminate from a deltoid base, castaneous, with pale edges, deciduous; spikes dense, oblong, apiculate, sessile,  $\frac{1}{4}$ –1 in. long.

Hab. Cosmopolitan in the warm temperate and tropical zones; rare in America. Very variable. The extremes are *E. pannonicum* Kit., with slender simple densely caespitose stems a foot or less long, with 4–6 ribs, and *E. altissimum* A. Br., with stout stems 3–4 ft. long, with  $\frac{3}{4}$ –1 in. sheaths and dense whorls of branches, simulating the small forms of *giganteum*.

13. *E. SIEBOLDI* Milde in Ann. Mus. Lug. Bat. i. p. 62; Mon. t. 25.—Barren and fertile stems alike, 1–1 $\frac{1}{2}$  ft. long, 1–12th to 1–6th in. diam., with a large central hollow and 6–10 smooth prominent ribs; branches short, simple, 1–3-nate; sheaths rather loose,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long including the persistent linear-subulate brown teeth; ribs of sheath grooved towards the apex and bordered on each side; spike unknown.

Hab. Japan, Siebold. Doubtfully distinct from *E. ramosissimum*.

14. *E. DEBILE* Roxb. in Vauch. Monog. 387; Milde, Mon. t. 26, *E. Timorianum* Vauch. Monog. t. 10. *E. pallens* Wall. *E. virgatum*, *laxum*, and *verticillatum* Blume. — Barren and fertile stems alike, usually 1–4 ft., rarely 8–10 ft. long, 1–12th to  $\frac{1}{2}$  in. diam., with a large central hollow, simple or irregularly branched; ribs 8–20, less prominent and not so scabrous as in *E. ramosissimum*; sheaths tight,  $\frac{1}{4}$ – $\frac{3}{4}$  in. long including the lanceolate acuminate brown margined deciduous tooth, the ribs of which are distinctly grooved on the back upwards and distinctly margined on each side; spike oblong, cuspidate, dense, subsessile,  $\frac{1}{4}$ – $\frac{3}{4}$  in. long.

Hab. Tropical Asia from the Himalayas and Ceylon eastward through the Malay Isles to Fiji. Doubtfully distinct from *E. ramosissimum*.

15.—*E. HYEMALE* Linn. Sp. edit. ii. 1517; Milde, Mon. t. 29; Hook. Brit. Ferns, t. 64; Eng. Bot. edit. iii. t. 1894. *E. asperimum* Gilib. *E. zonatum* Friv. — Barren and fertile stems alike, erect, persistent, branched at the base only, 2–3 ft. long,  $\frac{1}{4}$ – $\frac{1}{3}$  in. diam.; central hollow large; ribs 20–30, flat on the top, very scabrous; sheaths tight,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, pale green, with a distinct zone of black at the top and bottom; teeth very deciduous, small, connate, brown, with a membranous cusp; spike very dense, oblong, apiculate, sessile,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long.

Var. *Schleichleri* Milde. *E. paleaceum* Schleich. ex parte. *E. Moorei* Newm.; Eng. Bot. edit. iii. t. 1895.—Stems less persistent and more slender than in the type; ribs 8–20; sheaths not so tight and sometimes without the black basal ring.

Hab. North temperate and arctic zones of both hemispheres. Var. *Schleichleri*, from Ireland through Central Europe to Asia Minor.

16. *E. LÆVIGATUM* A. Br. in Sillim. Journ. 1844, 87; Milde, Mon. t. 32.—Barren and fertile stems alike, erect, persistent, very rarely branched above the base, 1–4 ft. long, about  $\frac{1}{4}$  in. diam.; ribs 20–30, smooth or nearly so; central hollow very large; sheaths not so tight as in *hyemale*,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, and only a few of the lowest sometimes furnished with a black basal ring; teeth deciduous,

castaneous, lanceolate acuminate from a persistent deltoid brown-black base; spikes oblong, apiculate, very dense,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long.

Hab. Canada and United States. Very nearly allied to *E. hyemale*.

17. *E. ROBUSTUM* A. Br. in Sillim. Journ. 1844, 88; Milde, Mon. t. 31. — Barren and fertile stems alike, 2–6 ft. long,  $\frac{1}{4}$ – $\frac{1}{2}$  in. diam., erect, persistent, branched at the base only; ribs 20–50, rounded, scabrous; central hollow very large; sheaths  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, pale green, with a distinct black basal band, square close ribs with a ridge on the back and very small connate ovate-lanceolate teeth, with a brown middle and pale edge, and persistent black base; spikes dense, oblong, apiculate, sessile,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long.

Hab. Canada, United States, Mexico, and, according to Milde, gathered also at Lahore by Jacquemont and Pondicherry by Belanger. Very near *E. hyemale*, and is probably the imperfectly-described *E. præaltum* Rafin. Fl. Ludov. 13 (1817).

18. *E. TRACHYODON* A. Br. in Bot. Zeit. 1838, 169; Milde, Mon. t. 33; Hook. Brit. Ferns, t. 65; Eng. Bot. edit. iii. t. 1896. *E. Mackaii* Newm. — Barren and fertile stems alike, branched at the base only, erect, persistent, 1–2 ft. long, 1-12th to 1-6th in. diam., with a moderately large central hollow; ribs 8–15, close, rounded, scabrous; sheaths tight, pale green,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, mostly with a black basal band and lanceolate acuminate brown teeth with a pale edge and persistent grooved black base, more persistent than in *E. hyemale*; lower sheaths entirely black; spikes small, dense, apiculate, sessile.

Hab. France, Germany, Ireland, and Scotland. Midway between *E. hyemale* and *E. variegatum*.

19. *E. VARIEGATUM* Schleich. Cat. Helv. 27; Milde, Mon. t. 34; Hook. Brit. Ferns, t. 66; Eng. Bot. edit. iii. t. 1897. *E. multi-forme* Vauch. Monog. t. 12. *E. reptans* Wahl. ex parte. — Barren and fertile stems alike, branched at the base only, tufted, persistent,  $\frac{1}{2}$ –1 ft. long,  $\frac{1}{2}$ –1 lin. diam.; central hollow small; ribs 6–12, ridged, scabrous, narrower than the valleculæ; sheaths rather ventricose, 1-12th to 1-8th in. long, black throughout or at the apex; teeth ovate cuspidate, brown-black, with a broad membranous edge; spikes small, sessile, cuspidate.

Hab. North temperate and arctic zones of both hemispheres. Vars. *arenarium* and *Wilsoni* approach *trachyodon* by their more robust habit and square grooved ribs.

20. *E. SCIRPOIDES* Michx. Fl. Bor. Amer. ii. 28; Vauch. Mon. tab. xi. fig. 3; Milde, Mon. t. 35. *E. reptans* Wahl. ex parte. — Barren and fertile stems alike, densely tufted, not branched above the base, 3–6 in. long,  $\frac{1}{2}$  lin. diam., without any perceptible central hollow; ribs 4–6, prominent, triquetrous, scabrous; sheaths black, ventricose, 1-12th to 1-8th in. long; teeth lanceolate acuminate, with a membranous border, deciduous from a persistent black base; spikes very small, dense, sessile, apiculate.

Hab. Northern and arctic regions of both hemispheres, ascending to 9000 ft. on the Rocky Mountains. Closely allied to the small forms of *E. variegatum*.



## Order 3.—LYCOPODIACEÆ.

*Sporangia* uniform, compressed or turbinate, 1-3-valved, 1-3-celled, placed singly in the axils of ordinary or modified leaves. *Spores* uniform, globose, granulated, without elaters, usually with three (rarely one) lines radiating from the apex, falling to the ground and giving rise to a fleshy prothallus. *Roots* fibrous. *Rootstock*, when present, trailing; in *Phylloglossum* an annual tuber. *Stems* produced, except in *Phylloglossum*, erect or creeping, alternately dichotomously forked, with a central bundle of vascular tissue. *Leaves* small, simple, 1-nerved, entire or serrated, continuous with the stem, usually uniform and multifarious, rarely dimorphic and distichous, as is usual in *Selaginella*. *Sporangia* placed sometimes in the axils of ordinary leaves all down the stem, sometimes aggregated in terminal spikes in the axils of modified leaves (bracts). *Vernation* circinate.

## 1. PHYLLOGLOSSUM\* Kunze.

*Sporangia* reniform, 1-celled, 2-valved, crowded in a peduncled spike, each placed free and singly in the axil of an ovate cuspidate bract. *Spores* with three lines radiating from the apex. A single species. Very distinct from the three other genera in its vegetative organs.

*P. DRUMMONDII* Kunze in Bot. Zeit. 1843, 721; Hook. Ic. t. 908; Benth. Fl. Austral. vii. 672. *Lycopodium Sanguisorba* Spring. — Acaulescent, with a few fleshy radical fibres and a pair of oblong tubers, the new one developed before the old one shrivels. Whole plant 1-1½ in. long. Leaves 6-9 in a basal rosette, linear-subulate, ascending, about ½ in. long. Spike ¼ in. long, consisting of about twenty multifarious sporangia, each subtended by a bract, the cusp of which overtops it.

Hab. West Australia, Tasmania, Victoria, and New Zealand.

## 2. LYCOPODIUM† Linn.

*Sporangia* coriaceous, reniform, compressed, 1-celled, dehiscing by a slit down the apex from end to end, placed free singly in the axils of unaltered leaves all down the stem or aggregated in terminal bracteated spikes. *Spores* with three lines radiating from the apex. *Stems* erect or prostrate, copiously branched. *Leaves* small, crowded, 1-nerved, usually uniform and multifarious, rarely dimorphous and distichous.

\* See a paper by Mettenius in 'Botanische Zeitung,' 1867, p. 97, and an elaborate recent account by Prof. Bower of its development and morphology in the 'Philosophical Transactions of the Royal Society,' Part 2, 1885, p. 665, tabs. 71-73.

† For further information see Hooker and Greville's Enumeration in Hooker's 'Botanical Miscellany,' vol. ii., p. 360, and Spring's elaborate Monograph in vols. xv. (1842) and xxiv. (1849) of 'Memoires de l'Academie royale de Belgique.'

## CLAVIS.

Subgenus 1. *SELAGO*. Sporangia placed in the axils of unaltered leaves all down the stem. Leaves multifarious.

Group of *L. Selago*. Stems comparatively short, erect or sub-erect. Usually terrestrial.

Leaves ascending . . . . . Sp. 1-7.  
Leaves spreading or squarrose . . . . . Sp. 8-19.

Group of *L. taxifolium*. Stems comparatively long, more or less decidedly pendulous. Usually epiphytic.

Leaves densely disposed, short . . . . . Sp. 20-25.  
Leaves densely disposed, longer . . . . . Sp. 26-35.  
Leaves laxly disposed . . . . . Sp. 36-39.

Subgenus 2. *SUBSELAGO*. Leaves multifarious, a little different from the bracts, but passing into them gradually. Sporangia aggregated into indistinct terminal spikes . Sp. 40-49.

Subgenus 3. *LEPIDOTIS*. Leaves multifarious. Sporangia aggregated into distinct terminal spikes, the bracts of which, except in the first group, differ decidedly from the proper leaves in shape and size.

Group of *L. inundatum*. Barren branches trailing, rooting to the tip fertile, simple, erect. Bracts scarcely different from the proper leaves. Terrestrial, in swamps . Sp. 50-52.

Group of *L. Phlegmaria*. Stems more or less decidedly pendulous, dichotomously forked from the base. Spikes slender, dichotomously forked, with bracts very different from the leaves. Epiphytic.

Leaves obtuse . . . . . Sp. 53-57.  
Leaves acute . . . . . Sp. 58-71.

Group of *L. cernuum*. Erect, with tree-like habit and stems unbranched towards the base. Terrestrial . Sp. 72-75.

Group of *L. clavatum*. Main stem wide-trailing, with ascending branches. Terrestrial.

Leaves large, not decurrent . . . . . Sp. 76-86.  
Leaves small, very decurrent . . . . . Sp. 87.

Group of *L. laterale*. Stems erect or spreading; spikes lateral. Terrestrial . Sp. 88-89.

Subgenus 4. *DIPHASIMUM*. Leaves distichous and dimorphous, as is usual in *Selaginella*. Sporangia collected into terminal spikes, with small bracts.

Stems slightly compound . . . . . Sp. 90.  
Stems long, very compound . . . . . Sp. 91-94.

## Subgenus I. SELAGO.

Group of *L. Selago*.

1. *L. COMPACTUM* Hook. Ic. t. 244.—Stems erect or suberect, 3–9 in. long, several times dichotomously forked; branchlets long or short, erect, cylindrical,  $\frac{1}{4}$  in. diam., including the leaves. Leaves very dense, ovate, obtuse, ascending, 1–12th to 1–8th in. long, very rigid, but not thick in texture, green or tinged with red, entire; midrib distinctly raised from the nearly flat back. Sporangia in the axils of unaltered leaves all down the stem.

Hab. High Andes of New Granada and Ecuador, 10,000–14,000 ft., Jameson! Hartweg, 1468! Spruce, 5611!

2. *L. CRUENTUM* Spring, Mon. ii. 34.—Densely tufted, little branched; barren stems short, trailing; fertile ascending, simple,  $\frac{1}{2}$ –1 in. long. Leaves crowded, linear, ascending, secund on the trailing stems, bright green or tinged with red, glossy, thick and firm in texture,  $\frac{1}{8}$  in. long, entire, concave on the face, rounded on the back. Sporangia in the axils of unaltered leaves all down the ascending branches.

Hab. New Granada, Purdie! Venezuela, in marshes of the Sierra Nevada, Moritz 372! Connects the *Selago* and *inundatum* groups.

3. *L. SELAGO* Linn. Sp. Plant. edit. ii. 1565; Schk. Crypt. t. 159; Hook. Brit. Ferns, t. 54. *Selago vulgaris*, Schur.—Stems erect, 3–9 in. long, several times dichotomously forked; branchlets erect, often short,  $\frac{1}{4}$  in. diam. including the leaves. Leaves crowded, ascending, lanceolate,  $\frac{1}{6}$ – $\frac{1}{4}$  in. long, green, glossy, entire or denticulate, moderately thick and firm in texture, often with buds in their axils; midrib obscure. Sporangia in the axils of unaltered leaves all down the stem.

Hab. Arctic and north temperate zones of both hemispheres; also New Zealand, Australia, Antarctic America, the Eastern Himalayas and mountains of Central Brazil. *Plananthus patens* P.B. (*L. reversum* Kit.) is a form with rather spreading leaves; *L. suberectum* Lowe, of Madeira and Azores is a luxuriant variety with suberect stems; *L. Haleakalæ*, Bracken Fil. Wilkes, tab. 45, fig. 2, of the Sandwich Isles, is a form with more slender branches and shorter leaves; *L. erubescens* Brack. Fil. Wikes, tab. 45, fig. 1, also from Sandwich Isles, is a form with red-tinted leaves, not more than  $\frac{1}{2}$  in. long; var. *saururoides* Bory et Durville in Mem. Linn. Soc. Paris, 1826 pl. 4, of the Falkland Islands and Ascension Island, approximates to *L. Saururus* by its longer, thicker leaves.

4. *L. JAMESONI* Baker.—Stems erect, 3–4 in. long, several times dichotomously forked; branchlets short, erect, cylindrical.  $\frac{1}{6}$ – $\frac{1}{4}$  in. diam. including the leaves. Leaves dense, ascending, lanceolate, acute,  $\frac{1}{8}$  in. long, thick in texture, green, tinged with red, strongly ciliated, rather convex on the back; midrib indistinct. Sporangia in the axils of unaltered leaves all down the stem.

Hab. Andes of Ecuador, Jameson! Midway between *L. erythraeum* and *Selago*.

5. *L. RUBRUM* Cham. in Linnæa, viii. 389; Kunze Farren., t. 40—Stems suberect, 6–9 in. long, once or twice dichotomously forked; branchlets long, erect. Leaves dense, multifarious, linear, straight



ascending,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, rigid, glossy, thick, red-green, entire, concave on the face, rounded on the back; midrib hidden. Sporangia in the axils of the unaltered leaves of the branches.

Hab. Mountain region of Central Brazil, *Sello!* *Glaziov!* 15801!

6. *L. ERYTHREUM* Spring, Mon. ii. 7.—Stems stiffly erect from a decumbent base,  $\frac{1}{2}$ –1 ft. long, 2–3-times dichotomously forked; branchlets long, erect, cylindrical,  $\frac{1}{4}$  in. diam. including the leaves. Leaves dense, adpressed, ascending, lanceolate,  $\frac{1}{6}$ – $\frac{1}{4}$  in. long, thick in texture, rigid, red-green, entire, concave on the face, rounded on the back. Sporangia in the axils of unaltered leaves all down the stem.

Hab. High Andes of Ecuador, from 10,000 ft. to the snow-line, *Jameson!* *Hartweg!* 1472! *Spruce!* 5609! *Pearce!* Nearly allied to *L. Saururus*.

7. *L. SAURURUS* Lam. Encyc. iii. 653; Bory Voy, i. 344, tab. 16, fig. 1, *L. elongatum* Sw.; Hook. et Grev. Ic. t. 224. *L. crassum* H. B. K. *L. axillare* Roxb.—Stems stiffly erect from a decumbent base, varying from a few inches to a foot in length, less branched than in *L. Selago*, and the branchlets longer,  $\frac{1}{2}$  in. in diam. including the leaves. Leaves dense, linear, acuminate, ascending,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, green or rarely tinged with red, thick and rigid in texture, entire or slightly denticulate, rounded on the back; midrib obscure. Sporangia hidden in the axils of unaltered leaves all down the stem.

Hab. Temperate and alpine zones of the Andes, Argentine region, Cameroons, Cape, Mascaren Isles, St. Helena, Tristan d'Acunha, Juan Fernandez, Marion Island and Kerguelen's Land. *L. axillare* Roxb., of St. Helena, has the leaves sometimes sharply ciliated.

8. *L. RUFESCENS* Hook. Ic. t. 36; *L. brevifolium* Hook. et Grev.—Stems erect, stout, hidden, about  $\frac{1}{2}$  ft. long, 1–4-times dichotomously forked; branchlets erect,  $\frac{1}{4}$ – $\frac{1}{3}$  in. diam. including the leaves. Leaves crowded, oblong, obtuse, green or red.  $\frac{1}{5}$  in. long, very thick and rigid in texture, entire; upper spreading; lower reflexed; midrib obscure. Sporangia in the axils of unaltered leaves all down the stem.

Hab. Alpine region of the Andes, of New Granada, Ecuador and Peru. Most like *L. compactum*, from which it differs by its reflexed leaves.

9. *L. HAMILTONII* Spreng. Syst. v. 429. *L. obtusifolium* Hamilt. non Sw. *L. alvifolium* Wall.; Hook. et Grev. Ic. t. 233. *L. vernicorum* Hook. et Grev. *L. empetrifolium* Dalzell.—Stems densely tufted, suberect or pendulous, varying from a few inches to a foot in length, 2–4-times dichotomously forked,  $\frac{1}{2}$ –1 in. diam. including the leaves. Leaves linear or linear-oblong, obtuse,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, not very dense, spreading, light green, glossy, thin but firm in texture; midrib distinct. Sporangia in the axils of unaltered leaves in the upper part of the stem.

Var. *petiolatum* C. B. Clarke. *L. taxifolium* Spring, as regards Wallich's Indian plant. Leaves narrower and thinner than in the type, subacute, distinctly narrowed at the base.

Hab. Himalayas, ascending to 5000 ft. in Kumaon, Moulmein, Lofanschan, Neilgherries, Concan, Ceylon. *L. vernicosum* H. & G. is a dwarf form, with much reflexed leaves.

10. *L. CRYPTOMERINUM* Maxim, Mel. Biol. vii. 340.—Stems robust, suberect, reaching a foot in length, once or twice dichotomously forked. Leaves linear, thick, rigid, acuminate, but not pungent,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, spreading or recurved in the mature plant. Sporangia placed in the axils of unaltered or slightly shortened leaves.

Hab. Mountains of Japan, *Maximowicz*; *Savatier* 1524. Named from its resemblance in habit to a leafy branchlet of *Cryptomeria japonica*.

11. *L. REFLEXUM* Lam. Encyc. iii. 653; Kunze Farren, t. 90. *L. bifidum* H. B. K. *L. eversum* Poir. *L. reversum* Presl.—Stems erect or pendulous,  $\frac{1}{2}$ –2 ft. long, 1–3 times dichotomously forked, branchlets often long,  $\frac{1}{4}$ – $\frac{1}{3}$  in. diam. including leaves. Leaves crowded, linear, spreading or squarrose,  $\frac{1}{6}$ – $\frac{1}{3}$  in. long, thin but firm in texture, bright green, naked or minutely ciliated on the edge; midrib distinct. Sporangia in the axils of unaltered leaves all down the stem.

Var. *densifolium* Baker.—Stems erect. Leaves very dense,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, the lower spreading, not squarrose.

Var. *L. intermedium* Spring, Mon. i. 27. *L. commutatum* Spring.—Stems pendulous. Leaves laxer than in the type, very much reflexed.

Hab. Mountains of Tropical America, from Cuba and Mexico to South Peru and South Brazil. Central Madagascar, *Hildebrandt* 4152! Mountains of Sumatra, *Beccari* 413! Var. *densifolium* connects the type with *L. rigidum*, *Hartweg* 1480! *Moritz* 2266! *Glaziou* 15797! Var. *intermedium* is founded on a plant of Central Brazil, gathered by Sello. We have it also from *Glaziou* 15800! Andes of Ecuador, *Spruce* 4793! and Demerara, *Richd. Schomburgk* 1192!

12. *L. MINIATUM* Spring Mon. i. 28. *L. rigidum* Blume non Gmel.—Stems suberect or pendulous, bright red, 9–12 in. long, simple or once or twice dichotomously forked,  $\frac{1}{2}$  in. diam. including leaves. Leaves linear, moderately dense, green, firm in texture, entire,  $\frac{1}{4}$  in. long, with a distinct midrib, the upper spreading, the lower reflexed. Sporangia in the axils of unaltered leaves all down the stems.

Mountains of Java, 4000–10,000 ft. *Junghun* 272! *Zollinger*! *Anderson*! *Beccari*! Differs from *lucidulum* by its red stem and equal leaves.

13. *L. CEYLANICUM* Spring Mon. i. 37.—Stems suberect, slender,  $\frac{1}{2}$ –1 ft. long, green, 1–3 times dichotomously forked  $\frac{1}{3}$ – $\frac{1}{2}$  in. diam. including leaves. Leaves moderately dense, lanceolate, entire, equal, firm in texture, bright green,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long; midrib distinct; upper spreading; lower reflexed. Sporangia in the axils of unaltered leaves all down the stem.

Hab. Mountains of Ceylon, alt. 6000 ft., *C. P.* 1415! Intermediate between *lucidulum* and *Selago*.

14. *L. LUCIDULUM* Michx. Fl. Bor. Amer. ii. 284 (Dill. Musc. tab. 56, fig. 2). *L. reflexum* Sw.; Schk. Crypt. t. 159, non Lam.—Stems suberect,  $\frac{1}{2}$ –1 ft. long, 1–3 times dichotomously forked,  $\frac{1}{2}$ – $\frac{3}{4}$  in. diam. including leaves. Leaves moderately crowded, lanceolate, bright green, firm in texture, glossy, entire,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, unequal; upper spreading; lower reflexed; midrib distinct.

Sporangia in irregular zones in the axils of shorter leaves interspersed with the longer ones all down the stem.

Hab. Canada, Newfoundland and United States. Japan, *C. Wright!* *Maries!* China; province of Kiu-kiang, *Maries!* Himalayas of Sikkim, 10,000—12,000 ft., *Sir J. D. Hooker!* *Clarke!* *Levinge!* Bourbon, *Delisle* 596! The Himalayan form, which has shorter, laxer leaves than the type, is figured by C. B. Clarke in Trans. Linn. Soc., series 2, vol. i. p. 84, fig. 1.

15. *L. XIPHOPHYLLUM* Baker, in Journ. Linn. Soc. inedit.—Stem erect, 6–8 in. long, strongly angled, simple. Leaves laxly disposed, lanceolate,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, acute, narrowed to the base, spreading or reflexed, bright green, moderately firm in texture, entire. Sporangia in the axils of the unaltered leaves of the upper half of the stem.

Hab. Central Madagascar, *Baron* 4512! It differs from *L. serratum* mainly by its entire leaves.

16. *L. SERRATUM* Thunb. Fl. Jap. 341, t. 38; Hook. et Grev. Ic. t. 37. *L. javanicum* Sw. *L. sulcinervium* Spring. *L. sargassifolium* Liebm.—Stems slender, suberect.  $\frac{1}{2}$ –1 ft. long, once or twice dichotomously forked. Leaves laxly disposed, lanceolate,  $\frac{1}{4}$ –1 in. long, 1–2 lin. broad, acute, much narrowed to base, thin in texture, bright green, crisped and serrated on the margin, often very irregular in size on the same branch; midrib very distinct. Sporangia in the axils of unaltered leaves all down the stem.

Hab. Japan, China, East Himalayas (ascending to 10,000 ft. in Manipur), Neilgherries, Ceylon, Java, Sumatra, Fiji, Samoa, Sandwich Isles, Mexico, and according to Swartz, also Bourbon.

17. *L. FIRMUM* Mett. Crypt. Nov. Gran. 391. *L. Sieberianum* Spring, ex parte.—Stems suberect or pendulous, strongly angled, a foot long, 2–4 times dichotomously forked,  $\frac{1}{2}$ – $\frac{3}{4}$  in. diam. including the leaves. Leaves crowded, linear, green, spreading, firm in texture, entire,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long; midrib distinct. Sporangia in the axils of unaltered leaves all down the stem.

Hab. Andes of New Granada, *Lindberg* 1521! *Kalbreyer!* Peru, *Matthews* 963! Central Brazil, *Lindberg!* Very near *L. rigidum*, with which it was united by Spring.

18. *L. RIGIDUM* Gmel. Syst. Nat. viii. 1289 (Dill. Musc. tab. 57, fig. 4). *L. squarrosus* Lam. non Forst. *L. Sieberianum* Spring ex parte.—Stems erect, 9–12 in. long, 2–3 times dichotomously forked; ultimate branchlets often long,  $\frac{1}{2}$  in. diam. including leaves. Leaves very crowded, spreading, linear,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, firm in texture, green, entire, channelled down the lower part of the face, 2-ribbed on the back. Sporangia in the axils of unaltered leaves all down the stem.

Hab. Mountains of the West Indies (Martinique, Guadeloupe, St. Vincent, &c.). Very near to *L. reflexum*, from which it differs by its more robust habit and denser leaves.

19. *L. MYRTUOSUM* Spring Mon. ii. 9.—Stems erect, stout, green, strongly angled, varying a few inches to above a foot in length, 1–3 times dichotomously forked,  $\frac{3}{4}$ –1 in. diam. including leaves. Leaves crowded, lanceolate, bright green,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, thick and firm in texture, entire, mucronate; midrib obscure;



upper spreading, lower reflexed. Sporangia in the axils of unaltered leaves all down the stem.

Hab. Andes of New Granada; Magdalena, *Purdie*! Bogs at Muna, alt. 12,000 ft., *Pearce*!

Group of *L. taxifolium*.

20. *L. FONTINALOIDES* Spring Fl. Bras. i. 112, tab. 5, fig. 2. *L. serpyllifolium* Fée Fil. Bras. t. 73.—Stems very slender, pendulous, stramineous or tinged with red,  $\frac{1}{2}$ –2 ft. or more long, several times dichotomously forked, about 1–12th in. diam. including the adpressed leaves. Leaves ovate, tetrastichous, not imbricated, 1–16th to 1–12th in. long, firm in texture, entire green or margined with red; midrib raised. Sporangia in the axils of unaltered leaves of the branches and branchlets.

Hab. Mountains of Brazil. Var. *mexicanum* Spring properly belongs to *L. verticillatum*.

21. *L. TETRAGONUM* Hook. et Grev. Ic. Fil. t. 109. *L. catharticum* Hook. in Ann. Nat. Hist. 428, t. 14.—Stems  $\frac{1}{2}$ –1 ft. long, generally pendulous, several times dichotomously forked; branchlets with the leaves square, 1–12th to 1–8th in diam. Leaves tetrastichous, ovate, much imbricated,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, green or reddish, glossy, thick and firm in texture, acutely keeled. Sporangia in the axils of the unaltered leaves of the branches and branchlets.

Hab. Alpine region of the Andes of Columbia, Ecuador and Bolivia, ascending to 12,000 ft. A violent purgative.

22. *L. MYRSINITES* Lam. Encyc. iii. 654. *L. heteroclitum* Desy. *L. quadrifariatum* Bory. *L. quadrangulare*, Spring in Fl. Bras. i. 112, tab. 5, fig. 1.—Stems pendulous, 2–3 ft. long, several times dichotomously forked, with the leaves square, 1–12th to 1–8th in. diam. Leaves tetrastichous, ovate, much imbricated, green,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, thick and firm in texture, entire, triquetrous on the back. Sporangia in the axils of the unaltered leaves of the branches.

Hab. Mountains of Brazil. *Gardner* 19! 5960! *Sello*! *Glaziou* 7494! 9068! *Weir* 388! *Miers*!

23. *L. SIEBOLDI* Miquel in Ann. Mus. Lug. Bat. iii. 184.—Stems pendulous, above a foot long, sparingly branched, cylindrical, at most 1 lin. diam. including the adpressed leaves. Leaves multifarious, rhomboid-lanceolate, 1–12th in. long, thick, green, glossy, adnate by a deltoid base, not imbricated, convex on the back, entire; midrib hidden. Sporangia in the axils of the unaltered leaves of the branchlets.

Hab. Mountains of Japan, *Siebold*, *Maries*! Very distinct.

24. *L. PECTEN* Baker in Journ. Linn. Soc. xv. 421.—Stems pendulous, above a foot long, 3–4 times dichotomously forked, cylindrical,  $\frac{1}{8}$  in. diam. including the adpressed leaves. Leaves dense, multifarious, ascending, linear, 1–12th to 1–8th in. long, green, very conspicuously pectinately ciliated with squarrose processes much longer than the breadth of the blade. Sporangia in the axils of the unaltered leaves of the branches and branchlets.

Hab. Central Madagascar, *Pool*! *Miss Gilpin*! Very distinct.



25. *L. VERTICILLATUM* Linn. fil. Suppl. 448 (Dill. Musc. tab. 56. fig. 3). *L. acerosum* Sw. *L. setaceum* Lam. *L. flaccidum* and *intermedium* Fée.—Stems slender, pendulous, stramineous,  $\frac{1}{2}$ –2 ft. long, several times dichotomously forked, about  $\frac{1}{8}$  in. diam. including the leaves. Leaves dense, ascending, linear-subulate, moderately firm in texture, green, entire,  $\frac{1}{4}$  in. long; midrib very distinct. Sporangia in the axils of the unaltered leaves of the branches and branchlets.

Var. *L. filiforme* Sw. *L. tenue*, H. B. K. *L. curvifolium* Kunze.—Stems very slender, sometimes 3–4 ft. long. Leaves not so dense, shorter, 1–12th to 1–8th in. long.

Hab. Throughout Tropical America, ascending to 10,000 ft. in the Andes; also Polynesia, Cape and Mascaren Isles.

26. *L. FUNIFORME* Chamisso; Spring Mon. i. 50; Kunze Farren, t. 79. — Stems very pendulous, sometimes 3–4 ft. long, little branched, cylindrical,  $\frac{1}{4}$  in. diam. including the adpressed leaves. Leaves dense, ascending, multifarious, much imbricated, linear-subulate,  $\frac{1}{4}$  in. long, firm in texture, green entire; midrib hidden. Sporangia in the axils of the unaltered leaves of the branchlets.

Hab. Cuba. West Indies and Guiana. Very distinct.

27. *L. SETACEUM* Hamilt. in D. Don. Prodr. Nep. 18, non Lam. *L. pulcherrimum* Wall.; Hook. et Grev. Ic. Fil. t. 38. *L. subulifolium* Wall.; Hook. et Grev. Ic. Fil. t. 49. *L. nilagiricum* Spring.—Stems pendulous,  $\frac{1}{2}$ –1 $\frac{1}{2}$  ft. long, several times dichotomously forked  $\frac{1}{4}$ – $\frac{1}{3}$  in. diam. including the adpressed leaves. Leaves crowded, ascending, linear, entire, green,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long; margin often rather involute or revolute; midrib distinct. Sporangia in the axils of the unaltered leaves of the branches and branchlets.

Hab. Himalayas, Neilgherries, Ceylon and Borneo, ascending to 6000 ft. in Sikkim.

28. *L. MOLLICOMUM* Mart.; Spring Fl. Bras. i. 113. *L. gramineum* and *setaceum* var. *brasiliense* Spring.—Stems pendulous,  $\frac{1}{2}$ –1 $\frac{1}{2}$  ft. long, several times dichotomously forked,  $\frac{1}{4}$ – $\frac{1}{3}$  in. diam. including the adpressed leaves. Leaves dense, ascending, linear-subulate, green, entire, moderately firm in texture,  $\frac{1}{8}$ – $\frac{1}{2}$  in. long; midrib very distinct. Sporangia in the axils of the unaltered leaves of the branches and branchlets.

Hab. Mountains of Guatemala, Panama, New Granada, Ecuador, Guiana and Brazil. Very near *L. setaceum*.

29. *L. PEARCEI* Baker.—Stems pendulous, a foot long, twice dichotomously forked,  $\frac{1}{8}$ – $\frac{1}{4}$  in. diam. leaves included. Leaves crowded, ascending, linear, green, rigid,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, acuminate, minutely rigidly ciliated; midrib distinct. Sporangia in the axils of the unaltered leaves of the long branchlets.

Hab. High Andes of Bolivia, *Pearce*! Allied to *L. Selago*.

30. *L. AFFINE* Hook. et Grev. in Hook. Bot. Misc. ii. 363.—Stems pendulous,  $\frac{1}{2}$ –1 $\frac{1}{2}$  ft. long, 2–3 times dichotomously forked;

branchlets  $\frac{1}{3}$ – $\frac{1}{2}$  in. diam. including the leaves. Leaves moderately dense, loosely ascending, lanceolate, about  $\frac{1}{4}$  in. long, green, firm in texture, strongly ciliated, acutely keeled. Sporangia in the axils of unaltered leaves all down the stem.

Hab. Alpine region of the Andes of Ecuador, especially Pichincha. Allied to *L. Selago* and *Saururus*.

31. *L. LINDENI* Spring Mon. ii. 27. — Stems slender, very pendulous, 2–3 ft. long, several times dichotomously forked,  $\frac{1}{8}$ – $\frac{1}{4}$  in. diam. including the leaves. Leaves moderately dense, ascending, lanceolate, acute,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, firm in texture, green, entire; midrib distinct. Sporangia in the axils of the unaltered leaves of the branches and branchlets.

Hab. Andes of New Granada, *Linden* 1002! Ecuador, *Jameson*! Allied to *Saururus* and *attenuatum*.

32. *L. ATTENUATUM* Spring Mon. ii. 48. — Stems pendulous  $\frac{1}{2}$ –1 ft. long, 3–4 times dichotomously forked,  $\frac{1}{4}$ – $\frac{1}{3}$  in. diam. including the leaves. Leaves dense, lanceolate, ascending, quite hiding the stem, acuminate, green or tinged with red,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, rigid but not thick in texture, entire; midrib obscure. Sporangia in the axils of unaltered leaves all down the stem.

Hab. High Andes of Columbia, Ecuador and Peru. Allied to *L. Saururus*. *Spruce's* 5609 is a variety with curved leaves less dense than in the type.

33. *L. INSULARE* Carm. in Trans. Linn. Soc. xii. 509. — Stems pendulous, a foot long, copiously pinnately and dichotomously branched. Leaves dense, lanceolate, reflexing, entire, glossy green,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, firm in texture but not very thick; midrib distinct. Sporangia in the axils of unaltered leaves.

Hab. Cliffs of Tristan d'Acunha, *Carmichael*! May be an extreme form of *L. Saururus*.

34. *L. HARTWEGIANUM* Spring Mon. ii. 14. — Stems pendulous, 1–2 ft. long, 3–4 times dichotomously forked,  $\frac{1}{3}$ – $\frac{1}{2}$  in. diam. including the leaves. Leaves lanceolate, dense, ascending, much imbricated, not very thick, rigid, green, entire; midrib obscure. Sporangia in the axils of the unaltered leaves of the branchlets.

Hab. High Andes of Ecuador and New Granada. Allied to *L. taxifolium*.

35. *L. TRENCILLA* Sodiro Recens Crypt. Vasc. Quit. 89. — Stems simple, pendulous, 1–2 ft. long, plicate with the decurrent bases of the leaves, red,  $\frac{1}{2}$  in. diam. exclusive of the leaves. Leaves ovate, ascending, multifarious, much imbricated,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, rigid, green, or tinged with red, obscurely denticulate; midrib obscure. Sporangia in the axils of unaltered leaves.

Hab. Andes of Ecuador, near the perpetual snow, *Sodiro*! Very distinct. The giant of recent lycopodiaceous types.

36. *L. SARMENTOSUM* Spring Mon. ii. 13. *L. capillare*, Sodiro Recens 90. — Stems very slender, pendulous, 1–2 ft. long, several times dichotomously forked, stramineous or bright red. Leaves laxly disposed, linear or subulate, loosely ascending  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, thin in texture, green, entire; midrib distinct. Sporangia in the axils of unaltered leaves,

Hab. Mountains of New Granada, Ecuador and Guiana. Intermediate between *L. linifolium* and *verticillatum*.

37. *L. LINIFOLIUM* Linn. Sp. Plant. edit. ii. 1563 (Dill. Musc. t. 57, fig. 5). *L. flexibile* and *heterocarpon* Fée.—Stems very slender, square, very pendulous, stramineous, several times dichotomously forked. Leaves linear, laxly disposed, loosely ascending,  $\frac{1}{3}$ –1 in. long, thin in texture, green, entire; midrib very distinct. Sporangia in the axils of unaltered leaves all down the stems.

Hab. Throughout Tropical America, from Mexico and the West Indies to Peru and South Brazil, ascending to 10,000 ft. in the Andes. *L. heterocarpon* differs from the type by closer leaves, of firmer texture and var. *sanguineum* Spring by its bright red stems.

38. *L. DICHOTOMUM* Jacq. Hort. Vind. iii. 26, t. 45. *L. pithyoides* Cham. et Schlecht. *L. mandioccanum* Raddi Fil. Bras. 77, t. 4. *L. polycarpon* Kunze.—Stems generally pendulous, about a foot long, several times dichotomously forked, 1–1½ in. diam. including the leaves. Leaves moderately dense, linear, generally spreading, upper loosely ascending, lower reflexed, usually  $\frac{1}{3}$ –½ in. long, moderately firm in texture, green, entire, not hiding the stem; midrib distinct. Sporangia in the axils of unaltered leaves of the branchlets.

Hab. Throughout Tropical America, from Cuba and the West Indies and Mexico, to Peru and South Brazil, ascending to 11,000 ft. in the Andes. Galapagos Isles; and found lately by Mr. and Mrs. Pool and Miss Gilpin in Central Madagascar. *L. mandioccanum* differs from the type by its narrower leaves. *L. pithyoides* is a form with very long narrow leaves.

39. *L. TAXIFOLIUM* Swartz Fl. Ind. Occ. iii. 1573; Hook et Grev. Ic. t. 131. *L. Herminieri* Spring.—Stems generally pendulous, 1–2 ft. long, several times dichotomously forked, ½–1 in. diam. including the leaves. Leaves lanceolate, rarely linear, moderately dense,  $\frac{1}{3}$ –¾ in. long, firm in texture, always green, entire, with a distinct midrib; lower generally spreading; upper loosely ascending. Sporangia in the axils of the unaltered leaves of the branchlets.

Var. *L. passerinoides* H. B. K. Nov. Gen. i. 41. *L. nitens* C. & S.—Habit more slender and leaves laxer, and not so firm in texture as in the type; those that subtend the sporangia rather abbreviated.

Var. *L. Brongniartii* Spring Mon. i. 33.—Leaves firm in texture, the lower reflexed.

Hab. Throughout Tropical America from Cuba and Mexico to Southern Brazil, ascending to 10,000 ft. in the Andes.

## Subgenus 2. SUBSELAGO.

40. *L. POLYTRICHOIDES* Kaulf. Enum. 6.—Stems very pendulous, a foot or more long, several times dichotomously forked, 1–16th to 1–12th in. diam. including the adpressed leaves. Leaves dense, ascending, linear-subulate, moderately firm in texture, bright green, entire, 1–12th to 1–8th in. long; midrib distinct. Sporangia in the axils of the ovate green bracts of the long slender branchlets.

Hab. Mountains of the Sandwich Islands. Habit and leaves as *L. verticillatum* var. *tenue*, from which it differs in its small bracts.



41. *L. CANCELLATUM* Spring Mon. ii. 27.—Stems pendulous, 1—2 ft. long, several times dichotomously forked, with long branches and branchlets, which are 1-12th to 1-8th in. diam. including leaves. Leaves multifarious, lanceolate, acuminate, green, much imbricated,  $\frac{1}{8}$ — $\frac{1}{6}$  in. long, firm in texture, acutely keeled. Sporangia in the axils of the ovate strongly-keeled green bracts of the cylindrical branchlets.

Hab. Himalayas of Bhotan, *Griffith*!

42. *L. CARINATUM* Desv. Ency. Bot. Suppl. iii. 559. *L. Flagellaria* Bory in Duper. Voy. i. 248, t. 26. *L. laxum* and *struthioloides* Presl. *L. acrostachyum* Wall.; Hook et Grev. Ic. t. 181. *L. pendulum* Roxb.—Stems pendulous, 1-2 ft. or more long, several times dichotomously forked,  $\frac{1}{4}$  in. diam. including the leaves. Leaves moderately close, ascending, lanceolate, acute, thick, green, rigid, entire,  $\frac{1}{4}$ — $\frac{1}{3}$  in. long; midrib distinct. Sporangia in long usually simple square spikes in the axils of ovate acute rigid green sharply-keeled bracts 1-12th to 1-8th in. long.

Hab. Neilgherries, Malay Peninsula, Malay Isles, Philippines, Formosa and Polynesia.

43. *L. FORDII* Baker.—Stems erect, under a foot long, 2—3 times dichotomously forked,  $\frac{1}{2}$  in. diam. including leaves. Leaves moderately close, lanceolate, acute, erecto-patent, bright green, entire, moderately firm in texture,  $\frac{1}{3}$  in. long. Sporangia in short erect spikes in the axils of lanceolate green reduced leaves  $\frac{1}{6}$ — $\frac{1}{8}$  in. long.

Hab. West China; Mountains of Lo-fau-shan, *Ford*! Allied to *L. carinatum*.

44. *L. STRICTUM* Baker in Journ. Bot. 1882, 271.—Stems tufted, stiffly erect, little branched,  $\frac{1}{2}$ —1 ft. long,  $\frac{1}{4}$ — $\frac{1}{3}$  in. diam. including leaves. Leaves oblong or linear-oblong, obtuse, dense, ascending, much imbricated, thick and rigid in texture, green, entire,  $\frac{1}{4}$ — $\frac{1}{3}$  in. long; midrib obscure. Spikes pendulous, simple, 1-12th to 1-6th in. diam.; bracts broad ovate, very thick, green, much imbricated, 1-16th to 1-12th in. long.

Hab. Mountains of Central Madagascar, *Parker*! *Baron* 3559! Allied to *L. gnidioides*. In an allied plant gathered both by Humblot 290 and Baron 1468, probably a high mountain form, the leaves resemble the bracts as above described, down to the very base of the stem.

45. *L. GNIDIODES* Linn. fl. Suppl. 448; Hook. et Grev. Ic. t. 50; Schlecht. Adumb. t. 2. *L. funiculosum* Lam. *L. pinifolium* Kaulf. *L. flagelliforme* Schrad.—Stems pendulous, 1-2 ft. or more long, several times dichotomously forked; branches about  $\frac{1}{2}$  in. diam. leaves included. Leaves oblong-lanceolate, moderately dense, ascending, obtuse, thick in texture, glossy green, entire,  $\frac{3}{8}$ — $\frac{1}{2}$  in. long; midrib distinct. Sporangia in lax copious spikes, often  $\frac{1}{2}$  ft. long, in the axils of thick ovate-oblong or ovate green bracts  $\frac{3}{8}$ — $\frac{1}{6}$  in. long.

Hab. Mountains of the Cape, Natal and Mascaren Isles.

46. *L. DACRYDIODES* Baker. *L. passerinoides* Kuhn, non H. B. K.

—Stems pendulous, 1–3 ft. long, several times dichotomously forked, about  $\frac{1}{2}$  in. diam. including the leaves. Leaves moderately dense, ascending, lanceolate, acute, thick and glossy, green, entire,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long; midrib distinct. Sporangia in long simple spikes in the axils of ovate-lanceolate green bracts  $\frac{1}{8}$ – $\frac{1}{4}$  in. long.

Var. *brachystachys* Baker.—Leaves and bracts shorter, very glossy. Spikes short.

Hab. Mountains of Transvaal, Natal, Zambesi-land, Cameroons, Fernando Po and St. Thomas. Var. *brachystachys*; Cameroons, Mann 2041!

47. *L. SQUARROSUM* Forst. Prodr. No. 479. *L. ulicifolium* Vent. Hook. Fil. Exot. t. 23. *L. epiceæfolium* and *Hippuris* Desv. *L. Forsteri* Poir. *L. Blumeianum* De Vriese. *L. proliferum* Blume. *L. Hookeri* Wall.; Hook et Grev. Ic. t. 183. *L. protensum* Hook. et Grev. *L. acutifolium* Desv.—Stems pendulous, 1–2 ft. long, 2–3 times dichotomously forked; branches and branchlets long,  $\frac{3}{4}$ –1 in. diam. including leaves. Leaves lanceolate, crowded, moderately firm in texture, dark green, entire, spreading or loosely ascending  $\frac{1}{3}$ – $\frac{3}{4}$  in. long; midrib distinct. Sporangia arranged in long usually simple spikes in the axils of much-reduced erectopotent lanceolate green leaves  $\frac{1}{8}$ – $\frac{1}{4}$  in. long.

Hab. East Himalayas, Khasia, Ceylon, Malay Isles, Philippines, Polynesia, Seychelles, Mascaren Isles.

48. *L. ECHINATUM* Spring Mon. ii. 24.—Stems stout, pendulous, stramineous, 2–3 ft. long, several times dichotomously forked,  $\frac{3}{4}$  in. diam. low down, including leaves. Leaves crowded, ascending, lanceolate, pale green, flattish, entire, firm and rigid in texture,  $\frac{3}{4}$  in. long; midrib hidden. Sporangia in long flexuose spikes  $\frac{1}{3}$  in. diam. in the axils of rigid ovate-lanceolate almost pungent acutely-keeled bracts  $\frac{1}{4}$ – $\frac{1}{3}$  in. long.

Hab. Andes of New Granada, Purdie! Allied to *L. taxifolium* var. *passerinioides* and *gnidioides*.

49. *L. DALHOUSIEANUM* Spring Mon. ii. 25. *L. glaucum* Cesati.—Stems robust, pendulous, little branched, stramineous, 2 ft. or more long, about 1 in. diam. including the leaves. Leaves crowded, ascending, rarely spreading, lanceolate, firm in texture, glaucous green, entire,  $\frac{3}{4}$ –1 in. long; midrib distinct. Sporangia in simple flexuose spikes 6–10 in. long in the axils of crowded ovate or ovate-lanceolate bracts  $\frac{1}{8}$ – $\frac{1}{4}$  in. long.

Hab. Mountains of Borneo and the Malay Peninsula, first gathered by Lady Dalhousie. A very distinct and striking species.

### Subgenus III. LEPIDOTIS.

#### Group of *L. inundatum*.

50. *L. INUNDATUM* Linn. Sp. Plant. edit. ii. 1566; Schk. Krypt. t. 160; Fl. Dan. t. 336; Hook. Brit. Ferns t. 51. *L. palustre* Lam.—Main stem trailing, simple, 2–4 in. long, sending out copious rootlets and 1–2 stiffly erect simple fertile branches 2–4 in. in. long. Leaves lanceolate, crowded, pale green, entire,  $\frac{1}{8}$ – $\frac{1}{6}$  in.

long, moderately firm in texture, with a distinct midrib, those of the trailing stem second, of the peduncle spreading or ascending. Spikes simple, stiffly erect,  $\frac{1}{2}$ –1 in. long,  $\frac{1}{4}$ – $\frac{1}{3}$  in. diam.; bracts crowded,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, lanceolate from a dilated toothed base.

Var. *L. Bigelovii* Tuckerm. *L. diversifolium* Nuttall.—Barren and fertile stems both much longer, sometimes a foot long. Spike sometimes  $\frac{1}{2}$  ft. long.

Hab. Swamps of Europe, Canada, Pennsylvania and New England. Var. *Bigelovii*, Pennsylvania, New England and Florida (var. *appressum*, Chapman). The whole plant perishes in winter except the tip of the trailing sterile stem.

51. *L. DRUMMONDII* Spring Mon. ii. 35. *L. serpentinum* Kunze.—Main stem trailing, branched, 2–4 in. or more long, sending out rootlets and distant stiffly erect simple fertile branches 2–6 in. long. Leaves of trailing stem crowded, lanceolate, ascending, much imbricated, glossy, pale green, entire, firm in texture,  $\frac{1}{8}$  in. long; midrib obscure; those of the peduncle much laxer, stiffly erecto-patent, very decurrent. Spikes simple,  $\frac{1}{2}$ – $\frac{1}{3}$  in. long, sometimes interrupted; bracts rigid, deltoid-cuspidate, erecto-patent, greenish yellow, 1–12th to 1–8th in. long.

Hab. Swan River, *Drummond*! Moreton Island, *Mueller*! New Zealand, *Colenso*! Habit of *L. carolinianum*, but leaves quite uniform.

52. *L. ALOPECUROIDES* Linn. Sp. Plant. edit. ii. 1565 (Dill, Musc. tab. 62, fig. 8); Schk. Crypt. t. 160. *L. longipes* Hook et Grev.—Barren stem trailing,  $\frac{1}{2}$ –2 ft. long, sending out copious roots, short procumbent sterile branches and distant stiffly erect fertile branches  $\frac{1}{2}$ –1 ft. long. Leaves of the trailing stems crowded, lanceolate, acuminate, pale green, entire,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, moderately firm in texture, spreading or ascending; those of the peduncle not so dense, more rigid, ascending, often ciliated. Spikes simple, 1–6 in. long  $\frac{1}{3}$ – $\frac{1}{2}$  in. diam.; bracts very crowded, linear, arcuate,  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, ascending or lower spreading.

Var. *L. contextum* Mart. Icon. Crypt. Bras. 38, tab. 20, fig. 1. *L. Matthewsii* Hook. Ic. t. 26.—More luxuriant, with spikes  $\frac{3}{4}$  in. diam.

Var. *L. Nettoanum* Glaziou.—Fertile and sterile branches of the trailing stem both assurgent and forked.

Hab. Throughout America, from the Northern United States to Monte Video, ascending to 8000 ft. in the Andes. Var. *aquaticum*, Spring, is a sterile submerged form with lax crisped leaves.

#### Group of *L. Phlegmaria*.

53. *L. CALLITRICHÆFOLIUM* Mett. Fil. Nov. Gran. 392. *L. aquilupianum* var. *obtusifolium* Spring.—Stem slender, flaccid, pendulous, 1–2 ft. long, several times dichotomously forked, stramineous, rarely bright red. Leaves lax, oblong or oblanceolate-oblong, obtuse,  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, moderately firm in texture, green, entire; midrib distinct. Spikes very slender  $\frac{1}{2}$ –1 ft. long, several times dichotomously forked; bracts lax, ovate, acute, a little longer than the sporangia.

Hab. Andes of New Granada and Ecuador, ascending to 10,000 ft. Habit of *L. subulatum*, but leaves very different.



54. *L. OBTUSIFOLIUM* Swartz, Syn. Fil. 177. *L. pachyphyllum* Kuhn. — Stem suberect or pendulous,  $\frac{1}{2}$ –1 ft. long, 1–3 times dichotomously forked. Leaves lax, ascending, broad ovate or suborbicular, deltoid at the apex,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, very rigid in texture, green or tinged with red, entire; midrib quite hidden. Spikes 1–4 in. long, simple or forked; bracts lax, ovate, rounded on the back, similar to the leaves in texture,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long.

Hab. Madagascar and Mauritius. Very distinct.

55. *L. NUMMULARIFOLIUM* Blume Enum. ii. 263; Hook. et Grev. Ic. t. 212. *L. rotundifolium* Roxb. — Stem slender, pendulous, 1–2 ft. long, 3–4 times dichotomously forked; branches divaricate. Leaves lax, ascending, broad oblong or suborbicular, obtuse, flat, glossy, green, rigid in texture, entire, about  $\frac{1}{4}$  in. long; midrib distinct. Spikes very slender, 2–12 in. long, dichotomously forked; bracts moderately dense, ascending, not much exceeding the sporangia.

Hab. Malay Peninsula and Isles, Amboyna and Erromanga.

56. *L. AQUALUPIANUM* Spring, Mon. i. 68. *L. guadalupianum* Fée Fil. Ant. t. 33, fig. 1. — Stem slender, pendulous,  $\frac{1}{2}$ –2 ft. long, 2–4 times dichotomously forked, stramineous, rarely bright red. Leaves lax, ascending, oblong, subobtuse,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, flat, green, entire; midrib distinct. Spikes varying from 3–4 in. to 1–1 $\frac{1}{2}$  ft. long, slender, several times dichotomously forked; bracts lax, ascending, ovate, acute, 2–3 times the length of the sporangia.

Hab. Cuba, West Indies, Guiana, and Andes of New Granada.

57. *L. PHLEGMARIOIDES* Gaudich. Freyc. Voy. t. 23. — Stem pendulous, 1–1 $\frac{1}{2}$  ft. long, pale, 2–4 times dichotomously forked. Leaves lax, ovate, ascending, obtuse or subacute,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, firm in texture, bright green, rigid, entire; midrib distinct. Spikes very slender, forked, 1–4 in. long; bracts moderately dense, broad ovate, equalling or but little exceeding the sporangia.

Var. *Seemannii* Baker. — Habit of *L. aqualupianum*. Leaves oblong, smaller, laxer and not so rigid as in the type. Bracts more acute and larger.

Hab. Malay and Polynesian Islands. Var. *Seemannii*, Fiji. *Seemann* 708! Samoa, *Whitmee*!

58. *L. VRIESEANUM* Spring Mon. ii. 33. — Stem suberect,  $\frac{1}{2}$  ft. long, 2–3 times dichotomously forked. Leaves crowded, erectopatent, lanceolate, acute, firm in texture, bright green,  $\frac{1}{8}$  in. long; midrib distinct. Spikes short, square, simple or forked,  $\frac{1}{2}$ –1 $\frac{1}{2}$  in. long,  $\frac{3}{4}$ –1 lin. diam.; bracts broad ovate, cuspidate, ascending, crowded, strongly keeled, the lower twice as long as the sporangia.

Hab. Java, on trees among the mountains, alt. 3000–5000 ft., *Junghuhn* 281!

59. *L. BILLARDIERI* Spring Mon. i. 56. *L. Flagellaria* A. Rich.; Duperrey Voy. t. 26, non Bory. *L. Flagellum* R. Br. — Stem pendulous, 1–3 ft. long, slender, wiry, copiously dichotomously forked from the base. Leaves lax, ascending, decurrent, firm in texture, linear, green, glossy, with a distinct midrib; lower  $\frac{1}{2}$ – $\frac{3}{4}$  in.

long; upper much smaller. Spikes copious, dichotomously forked, 1-4 in. long, slender, square, 1-12th in. diam.; bracts ovate, acute, scarcely exceeding the sporangia,  $\frac{1}{2}$  lin. long.

Hab. New Zealand, Sunday Island, Raoul Island. Spikes more slender than in *L. varium*, with which Mr. Kirk unites it, and leaves longer and narrower.

60. *L. VARIUM* R. Br. Prodr. 165; Hook. et Grev. Ic. t. 112. *L. myrtifolium* Forst.? — Stems suberect or pendulous, stout, stramineous,  $\frac{1}{2}$ -1 ft. long, 2-3 times dichotomously forked. Leaves moderately dense, lanceolate or oblanceolate, obtuse or subacute,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, firm in texture, green, glossy, with revolute edges and a distinct midrib. Spikes dense, subtetragonous, 3-6 in. long,  $\frac{1}{6}$ - $\frac{1}{4}$  in. diam., once or twice forked; bracts broad ovate, acute, imbricated,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long.

Hab. Australia, Tasmania, New Zealand and Auckland Isles.

61. *L. SUBULATUM* Desv. Encyc. Suppl. iii. 544. *L. phylicæ-folium* Desv. *L. congestifolium* Spring. *L. biforme* Hook. Ic. t. 228.—Stem pendulous, slender, flaccid, stramineous, sometimes 2-3 ft. long, several times dichotomously forked. Leaves lax, ascending, rarely spreading, lanceolate, acuminate,  $\frac{1}{3}$ - $\frac{3}{4}$  in. long, moderately firm in texture, green, entire; midrib distinct. Spikes  $\frac{1}{2}$ -1 ft. long, several times dichotomously forked, 1-12th in. diam.; bracts broad ovate, green, keeled on the back, sometimes with a short cusp, as long as or a little longer than the sporangia.

Hab. Throughout Tropical America, ascending to 12,000 ft. in the Andes of Ecuador. *L. phylicæfolium* is a form with stouter denser subtetragonous spikes; *L. erythrocaulon* Fée Fil. Mas. Suppl. 95, t. 106, fig. 2, a form with short bright red stems and short dense spikes, and var. *pastoensis* Baker, gathered by Jameson in Ecuador, a form with narrow linear spreading rather arcuate leaves and very slender spikes with some of the bracts changed into proper leaves. A form with short bright red stems and short rigid leaves was gathered by Mann and Brigham, 506, in the Sandwich Islands.

62. *L. OPHIOGLOSSOIDES* Lam. Encyc. iii. 646. *L. longifolium* Sw.—Stem slender, pendulous 1-2 ft. long, dichotomously forked from the base. Leaves moderately dense, ascending, lanceolate, acute, flat, moderately firm in texture, green, entire,  $\frac{1}{3}$ - $\frac{1}{2}$  in. long; midrib distinct. Spikes 5-8 in. long, several times dichotomously forked,  $\frac{1}{8}$  in. diam.; bracts moderately dense, ovate, acute, ascending, 1-12th-1-8th in. long.

Hab. Bourbon, Comoro Isles, Cameroons (at 7000 ft.), and Fernando Po. Nearly allied to *L. Billardieri*.

63. *L. PINIFOLIUM* Blume Enum. Jav. ii. 264.—Stem slender, pendulous, 6-9 in. long, 2-3 times dichotomously forked. Leaves moderately dense, erecto-patent, lanceolate, about  $\frac{1}{4}$  in. long, green, moderately firm in texture; midrib distinct. Spikes 1-3 in. long, 1-3 times dichotomously forked, 1-12th in. diam.; bracts ovate, acuminate, ascending, usually considerably longer than the sporangia.

Hab. Java, Borneo and New Guinea. Very near *L. Phlegmaria*.

64. *L. MARTII* Wawra Reise 185, t. 32.—Stem suberect,  $\frac{1}{2}$  ft. long, 2-3 times dichotomously forked. Leaves dense, ascending,

lanceolate, acuminate,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, green, entire, moderately firm in texture; midrib distinct. Spikes 1–2 in. long, simple or forked; bracts dense, ovate, lower acuminate, twice as long as the sporangia, upper shorter, acute.

Hab. Ilheos, Brazil, *Wawra & Maly* 339.

65. *L. CORALIUM* Spring Pl. Junghuhn, 273.—Stem pendulous, slender, dichotomously forked, a foot long. Leaves moderately close, lanceolate, erecto-patent,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long,  $\frac{1}{8}$  in. broad, flat, green, entire; midrib distinct. Spikes slender, flexuose, 1–12th in. diam. 2–4 in. long, once or twice forked; bracts imbricated, ovate, acute, 1–12th in. long,

Hab. Malacca, Java, New Guinea. Very near *L. Phlegmaria*.

60. *L. APICULATUM* Spring Pl. Junghuhn, 272. *L. phyllocarpon* Hook et Grev.—Stem pendulous, 1–2 ft. long, 2–3 times dichotomously forked. Leaves moderately dense, lanceolate, acuminate, moderately firm in texture, bright green, entire,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, 1–12th in. broad; midrib distinct. Spikes 2–6 in. long, dichotomously forked,  $\frac{1}{8}$  in. diam.; bracts ovate, acuminate, moderately dense, ascending,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long.

Hab. Polynesia and Malay Isles. Nearly allied to *L. Phlegmaria*.

67. *L. PHLEGMARIA* Linn. Sp. Plant. edit. ii. 1564 (Dill. Musc. t. 61). *L. mirabile* and *australe* Willd. *L. ericæfolium* Presl.—Stem pendulous,  $\frac{1}{2}$ –2 ft. long, 2–4 times dichotomously forked, always stramineous. Leaves moderately close, spreading or ascending, ovate or ovate-lanceolate  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, firm or moderately firm in texture, always green, rounded or cordate at the base, flat, entire; midrib distinct. Spikes copious, flaccid, 3–6 in., rarely a foot long, usually forked both at and above the base, 1–12th in. diam.; bracts ovate, green, wrinkled on the back, not cuspidate, as long as or a little longer than the sporangia.

Hab. Common throughout the Tropics of the Old World, extending to the Eastern Himalayas, Queensland, and New Zealand. *L. australe* is a form with cordate-ovate leaves and *L. mirabile* a form with narrower leaves than the type and more slender spikes.

68. *L. FILIFORME* Roxb. Fl. Ind. edit. Clarke 741. *L. ruscifolium* Lowe. *L. amboinense* R. Br. *L. Phlegmaria* var. *furcatum* Spring.—Stems very slender, 1–2 ft. long, several times dichotomously forked from the base. Leaves lax, ovate, acute, spreading, moderately firm in texture, dark green, entire,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long; base broadly rounded or cordate; midrib distinct. Spikes very slender, 2–6 in. long, dichotomously forked, under a line in diameter; bracts lax, ovate, ascending, dark green, scarcely exceeding the sporangia.

Hab. Ganges delta, Malay Peninsula, Java, Sumatra, Borneo, Amboyna and Philippines. Scarcely more than a small slender variety of *L. Phlegmaria*.

69. *L. PHYLLANTHUM* Hook. et Arn. Bot. Beech. 103. *L. macrostachys* Hook. *L. pachystachyon* Spring.—Stem stout, stramineous, suberect or pendulous, 1–1 $\frac{1}{2}$  ft. long, once or twice dichotomously forked. Leaves moderately dense, spreading, ovate-lanceolate,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, bright green, very firm in texture, with revolute



edges and a distinct midrib. Spikes 3-9 in. long, 2-3 times dichotomously forked,  $\frac{1}{8}$ - $\frac{1}{6}$  in. diam.; bracts broad ovate, acute, imbricated, distinctly keeled, a little longer than the sporangia.

Var. *L. nutans* Bracken. Fil. Wilkes Expedit. 327, t. 46. — Leaves narrower, denser and more acuminate than in the type. Spikes short, usually simple, erect,  $\frac{1}{4}$ - $\frac{1}{3}$  in. diam.; bracts leaf-like, lanceolate,  $\frac{1}{4}$ - $\frac{1}{3}$  in. long.

Hab. Neilgherries, Ceylon, Borneo, Samoa and Sandwich Islands. Var. *nutans*, Madagascar, New Caledonia, and Sandwich Isles.

70. *L. MEGASTACHYUM* Baker in Journ. Linn. Soc. xxi. 454. — Stem stout, suberect, once forked, under a foot long. Leaves dense, reflexed, ovate-lanceolate, acuminate,  $\frac{1}{3}$ - $\frac{1}{2}$  in. long, firm in texture, green, entire, with revolute edges and a distinct midrib. Spikes pendulous, cylindrical, forked, 4-6 in. long,  $\frac{1}{6}$  in. diam.; bracts dense, ovate, acute, rugose on the back, not distinctly keeled, 2-3 times the length of the sporangia.

Hab. Forests of Central Madagascar, *Baron* 2840!

71. *L. ROBUSTUM* Klotzsch in Linnæa xviii. 518. — Stem stout, suberect, stramineous,  $1\frac{1}{2}$  ft. long, 2-3 times dichotomously forked. Leaves moderately dense, spreading, lanceolate,  $\frac{1}{2}$ - $\frac{5}{8}$  in. long, firm in texture, with revolute edges and a distinct midrib. Spikes stout, 3-4 in. long, 2-3 times forked; bracts ovate, acute,  $\frac{1}{8}$  in. long.

Hab. Demerara, *Richd. Schomburgk* 1209.

#### Group of *L. cernuum*.

72. *L. CERNUUM*, Linn. Sp. Plant. edit. ii. 1566 (Dill. Musc. tab. 63, fig. 10). *L. Boryanum* A. Rich. *L. capillaceum* Willd. — Stems stiffly erect, sometimes 3-4 ft. long, simple towards the base, copiously branched upwards; lower branchlets copiously compound, short, divaricate, ascending or pendulous. Leaves crowded, linear, subulate with revolute edges,  $\frac{1}{8}$  in. long, pale green, with a midrib prominently raised beneath, lower spreading, upper arcuate-ascending. Spikes sessile at the end of the branchlets, many to a branch, cylindrical,  $\frac{1}{4}$ - $\frac{3}{4}$  in. long; bracts broad ovate, with a large cusp, ascending, densely ciliated.

Var. *L. marianum* Willd. Sp. Plant. *L. ericinum* Cesati. — Leafy branchlets not much thicker and denser than in type, but leaves longer and more rigid, conspicuously curved.

Var. *L. curvatum* Sw. Syn. 178, 402. *L. vulcanicum* Blume. *L. convolutum* Desv. — Scaly branchlets stouter and more crowded than in the type. Leaves longer, very rigid, conspicuously curved.

Var. *L. pendulum* Hook. Ic. t. 90. *L. Eichleri* Fée Fil. Bras, t. 106, fig. 4. — Leaves as in the last but final branches long and pendulous.

Hab. Cosmopolitan in the Tropics of both hemispheres and extending beyond them to Japan, the Azores, Cape Colony, New Zealand, and St. Paul's Island in the South Indian Ocean. Karl Muller in Bot. Zeit. 1861, p. 161, divides this into seven species, *cernuum*, *Heeschii*, *secundum*, *sikkimense*, *Moritzi*, *Hupeanum*, and *marianum*.

73. *L. DENSUM* Labill. Pl. Nov. Holl. ii. 104, tab. 251, fig. 1.—Stems stiffly erect, 2–6 ft. long, simple towards the base, copiously branched upwards, with crowded ascending branches and branchlets, the latter 1-12th to 1-8th in. diam. including the leaves. Leaves crowded, linear or lanceolate acuminate, erecto-patent or ascending,  $\frac{1}{2}$ –1 $\frac{1}{2}$  line long, firm in texture, pale green, shortly aristate; midrib distinct. Spikes copious, terminal on the branchlets, sessile, cylindrical, many to a branch,  $\frac{1}{2}$ –1 in. long, 1-12th to 1-8th in. diam.; bracts broad ovate, not cuspidate.

Hab. Australia, Tasmania, New Zealand, Norfolk Island and New Caledonia, in elevated situations on the ground.

74. *L. OBSCURUM* Linn. Sp. edit. ii. 1566 (Dill. Musc. t. 67). *L. japonicum* Thunb. *L. dendroideum* Michx.; Schk. Krypt. t. 64; Hook. Exot. Flora t. 7.—Stems erect, 1–1 $\frac{1}{2}$  ft. long, simple at the base, copiously branched upwards, with crowded mostly ascending branches and branchlets. Leaves lax, erecto-patent, lanceolate, mucronate,  $\frac{1}{8}$  in. long, firm in texture, bright glossy, green; midrib distinct. Spikes 1–6, terminal on the upper branchlets, erect, cylindrical, sessile,  $\frac{1}{2}$ –1 $\frac{1}{2}$  in. long; bracts broad ovate, acute, not cuspidate, ascending, imbricated.

Hab. Newfoundland, Canada to Carolina, Japan, Kamschatka and Siberia.

75. *L. CASUARINOIDES* Spring Mon. i. 94; Hook. Ic. t. 968. *L. rubellum* Presl. *L. comans* and *filicaule* Hook. fil.—Stems wide-scantent; branches copiously compound; final branchlets sometimes 6–9 in. long, pendulous. Leaves very variable, conspicuously decurrent, firm in texture, green or reddish, lanceolate aristate, sometimes distant, with only a minute free blade with a hyaline apex, sometimes closer, with a lanceolate aristate arcuate free blade  $\frac{1}{8}$  in. long. Spikes by themselves on special branchlets, panicled, 1–3 in. long, cylindrical,  $\frac{1}{8}$  in. diam.; bracts broad ovate, ascending, decidedly cuspidate.

Hab. Khasia, Assam, Bhotan, Malacca, China, Philippines, Java, Borneo and Sumatra.

#### Group of *L. clavatum*.

76. *L. SPRUCEI* Baker.—Main stem short, simple, epigæous, sending out copious rootlets and stiffly erect simple or forked leafy stems, 6–9 in. long. Leaves very dense, lanceolate, acuminate,  $\frac{1}{6}$  in. long, firm in texture, green, ascending, with a sulcate midrib, so that they appear 2-nerved on the keel. Spikes sessile and solitary at the end of the leafy branches, 1 $\frac{1}{2}$ –2 in. long; bracts dense, stramineous, broad ovate, with a very large erecto-patent or squarrose cusp.

Hab. Venezuela; San Carlos del Rio Negro, Spruce 3151! A very distinct species, connecting the groups of *inundatum* and *clavatum*.

77. *L. MAGELLANICUM* Sw. Syn. Fil. 180.—Main stem wide-trailing, epigæous or hypogæous; branches short, ascending; lower copiously compound, with short branchlets. Leaves crowded, lanceolate, arcuate-ascending.  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, thick in texture, green, mucronate,

not aristate; midrib distinct. Spikes sessile or nearly so at the end of the leafy branchlets, stouter than in *clavatum*, 1–2 in. long, often many to a branch; bracts imbricated, broad ovate, with a large finally squarrose cusp.

Var. *Cunninghami* Baker.—A stout condensed variety with large thick second leaves and very large spikes, 3–4 in. long,  $\frac{1}{2}$  in. in diam.; bracts with very large cusps.

Hab. South Chili, Terra del Fuego, South Patagonia, Falkland Isles, Kerguelen's Land, Staten Land, Marion Islands. Var. *Cunninghami*; Straits of Magellan, *Dr. Coppinger*! Falkland Isles, *Dr. Cunningham*!

78. *L. CONTIGUUM*, Klotzsch in Linn. xviii. 519. — Main stem wide-trailing, rooting copiously; branches erect; lower sparingly compound, 6–9 in. long, with a few long erect branchlets. Leaves crowded, arcuate ascending, lanceolate,  $\frac{1}{8}$  in. long, tipped with a short awn, rigid in texture, green, midrib distinct. Spikes usually simple, 1–2 in. long, stouter than in *clavatum*, sessile at the end of the leafy branchlets, never more than few to a branch; bracts broad ovate, with a long sub-squarrose cusp.

Hab. High Andes of New Granada, Ecuador, and Bolivia.

79. *L. RAMULOSUM* Kirk in Trans. New Zeal. Instit. xi. 456, tab. 19, fig. B.—Stems densely tufted, 2–3 in. long, ascending, sparingly branched. Leaves lanceolate, mucronate not aristate, moderately dense, ascending or spreading, firm in texture, green,  $\frac{1}{8}$  in. long, distinctly keeled. Spikes terminal and solitary, sessile at the end of the leafy branches,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long; bracts ascending, imbricated, broad ovate, cuspidate.

Hab. New Zealand; Hokitika, *Tipler* (Kirk 831!) Differs mainly from *L. diffusum* by its entirely terminal spikes.

80. *L. ANNOTINUM* Linn Sp. Plant. edit. ii. 1566 (Dill. Musc. t. 63, fig. 9); Fl. Dan. t. 127; Schk. Crypt. t. 162; Hook. Brit. Ferns, t. 50. *L. juniperifolium* Lam.—Main stem caudate, trailing to a length sometimes of several feet; branches ascending; upper simple, lower copiously compound. Leaves moderately close, lanceolate, spreading, or lower reflexed,  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, mucronate, denticulate, firm in texture, green, shortened and ascending at the nodes where growth has been suspended; midrib distinct. Spikes solitary, sessile at the end of the leafy branchlets, often many to a branch, cylindrical, 1–1 $\frac{1}{2}$  in. long; bracts broad ovate, shortly cuspidate, ascending, stramineous, much imbricated.

Hab. Arctic zones and mountains of the north temperate zone in both hemispheres, ascending to 14,000 ft. in the Eastern Himalayas. Var. *pungens* Spring is a high mountain form with smaller, thicker, more distinctly pointed ascending leaves.

81. *L. DIAPHANUM* Sw. Syn. Fil. 179; Hook. et Grev. Ic. t. 227. —Main stem wide-trailing, epigæous, densely leafy throughout; branches ascending; lower about  $\frac{1}{2}$  ft. long, sparingly compound. Leaves very dense, linear, with a long awn, ascending, much imbricated, firm in texture, green,  $\frac{1}{8}$  in. long; midrib distinct. Spikes sessile at the end of the leafy branchlets, simple or forked,



stouter than in *clavatum*; bracts broad ovate, narrowed into a hair-like point.

Hab. Tristan d'Acunha, *Carmichael*!

82. *L. vestitum*. Desv. Encyc. Suppl. iii. 546. *L. scarosum* Hook. Ic. t. 89, non Forst. *L. sericeum* Hook, fil.—Main stem wide-trailing, epigæous, densely leafy; branches ascending, lower sparingly compound. Leaves very crowded, ascending, adpressed, linear,  $\frac{1}{6}$  in. long, pale green and firm in texture in the lower half, membranous and white towards the tip. Spikes simple or forked at the end of the leafy branchlets, stouter than in *clavatum*, sometimes 3–4 in. long; bracts very large, lanceolate from a broad base, hyaline upwards and denticulate.

Chacapoyas, Peru, *Mattheus* 1765! I have not seen the New Granadan plant of Humboldt, placed here by Spring.

83. *L. spurium* Willd. Sp. Plant. v. 28; *L. glaucescens* Presl. *L. pichinchense* Hook. Ic. t. 85.—Main stem trailing, hypogæous; lower branches copiously compound, 3–4 in. long, with short divaricate branchlets. Leaves crowded, lanceolate, loosely ascending,  $\frac{3}{8}$ – $\frac{1}{6}$  in. long, firm in texture, green, glossy, mucronate not aristate; midrib obscure. Spikes 1–3 in. long, several to each main branch, each sessile at the end of the branchlets or 2–4 on a short peduncle ending its main axis; bracts broad ovate, with a large cusp.

Hab. High Andes of Ecuador. The Brazilian *L. assurgens* Fée has more compound branches, narrower leaves, and squarrose bracts.

84. *L. clavatum* Linn. Sp. Plant. edit. ii. 1564 (Dill. Musc. tab. 58, fig. 1); Fl. Dan. t. 126; Hook. Brit. Ferns, t. 49.—Main stem trailing to a length of several feet, caudate; lower branches often  $\frac{1}{2}$  ft. long, copiously compound. Leaves crowded, lanceolate with distinct awn,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, loosely arcuate ascending, green, firm in texture, often denticulate; midrib distinct. Spikes 1–3 on a long common peduncle with distant adpressed bracts, cylindrical, 1–2 in. long,  $\frac{1}{6}$  in. diam.; bracts broad ovate with a distinct mucro, rigid, stramineous, much imbricated.

Hab. Arctic and alpine zones of both hemispheres; also mountains of Tropical Asia, Africa and America, Cape Mascaren Isles and Polynesia. Very variable, the following being the principal named varieties: *L. trichiatum* Bory; Fée Fil. Bras. t. 107. Tropical America and Bourbon. Leaves more rigid, with a very distinct awn, the lower spreading or recurved, a longer peduncle and 4–8 spikes. — *L. aristatum* H.B.K. Andes and West Indies, with very crowded ascending rigid aristate leaves and 4–6 spikes. — *L. piliferum* Raddi Fil. Bras. t. 3. A form between the last and the type. — *L. eriostachys* Fée. Brazil, with the main stem terminated by a tuft of rootlets. — *L. venustum* Gaudich in Freyc. Voy. Bot. t. 22. Sandwich Isles, with short very rigid, ascending inflexed leaves, long spikes, and squarrose bracts. — *L. heterophyllum* Hook. Ic. t. 113. Owhyee. Differing from the last mainly by its less crowded leaves. — *L. inflexum* Swartz. Cape and Madagascar. More rigid inflexed leaves than the type, channelled down the face and 2–4 long spikes. — *L. divaricatum* Wall., of India and Java. Sterile branches very compound, main stem but sparsely leafy, leaves of branches narrower and laxer, a long peduncle with 5–6 long spikes. — *L. tamariscispica* Cesati. New Guinea, with very short rigid incurved leaves, a long peduncle, and 6–8 spikes.

85. *L. FASTIGIATUM* R. Br. Prodr. 165.—Main stem trailing, hypogæous; lower branches copiously compound, sometimes a foot long and naked at the base; branchlets crowded. Leaves crowded, lanceolate, arcuate,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, firm in texture, green, mucronate, not aristate; midrib obscure. Spikes several to a main branch, sessile at the tip of the branchlets or many in a central peduncled panicle; bracts broad ovate with a large cusp.

Hab. South Australia, Tasmania, New Zealand, Auckland and Campbell Isles. Very variable. The large forms come in midway between *clavatum* and *paniculatum*. The small states are not distinguishable from *magellanicum*.

86. *L. PANICULATUM*, Desv. Encyc. iii. 543. *L. dendromorphum* Kunze. Main stem trailing to a length of several feet, hypogæous or sparsely leafy; lower branches copiously compound, sometimes 2 ft. long. Leaves crowded on the branchlets, linear, arcuate, firm in texture, green,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, mucronate, not aristate; midrib obscure. Peduncle direct from the rhizome or terminating the axis of a leafy branch, sometimes with several short ascending branches, with several crowded spikes to each; spikes more slender than in *clavatum*; bracts finally squarrose, broad ovate, with a large cusp.

Hab. Mountains of Peru and Chili.

87. *L. ALPINUM* Linn. Sp. Plant. edit. ii. 1567; Schk. Crypt. t. 161; Hook. Brit. Ferns, t. 53. — Main stem wide-trailing, usually hypogæous, with leaves only rudimentary; branches ascending; lower copiously flabellulately compound; branchlets nearly square, 1-12th in. diam. including the adpressed leaves. Leaves ovate-lanceolate,  $\frac{1}{8}$  in. long, decurrent on the stem, adpressed, thick in texture, green, entire, rounded on the back; midrib hidden. Spikes cylindrical,  $\frac{1}{2}$ –1 in. long, sessile at the end of the leafy branchlets; bracts broad ovate, acute, ascending, imbricated.

Var. *L. sabinæfolium* Willd. Sp. Plant. v. 20. — Leaves narrower and more acute. Spikes shortly peduncled.

Var. *L. nikoense* Franch. et Savat. Enum. Jap. ii. 198. — Leaves narrower and more acute than in the type, not adpressed. Spikes distinctly peduncled.

Hab. Arctic zones and mountains of the north temperate zone in both hemispheres. Var. *sabinæfolium*. Rocky Mountains and Newfoundland. Var. *nikoense*. Japan.

#### Group of *L. laterale*.

88. *L. DIFFUSUM* R. Br. Prodr. 105. non Spring. — Stems intermatted, 2-9 in. long, trailing at base, ascending at the end and distinctly branched; branches slightly compound, with divaricate branchlets. Leaves moderately dense, lanceolate, ascending, pale green, or tinged with brown, firm in texture, glossy, 1-12th to 1-8th in. long; midrib obscure. Spikes many, simple, cylindrical,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, lateral or terminal on short branchlets.

Hab. Victoria and Tasmania. Intermediate between *L. laterale* and *L. magellanicum*. The plant described as *L. diffusum* by Spring is *L. fastigiatum* R. Br.

89. *L. LATERALE* R. Br. Prodr. 165; Labill. Sertum, t. 15.—Stems erect, or decurrent at the base, simple or little branched,  $\frac{1}{2}$ – $1\frac{1}{2}$  in. long. Leaves moderately dense, linear-lanceolate, moderately firm in texture, pale green, ascending or the lower spreading,  $\frac{1}{6}$ – $\frac{1}{4}$  in. long; midrib distinct; edges revolute. Spikes many, sessile, lateral, simple, ascending,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long; bracts rigid, stramineous, imbricated, broad ovate, with a large cusp.

Hab. Australia, New Zealand and New Caledonia. Very distinct.

#### Subgenus IV. DIPHASIUM.

90. *L. CAROLINIANUM* Linn. Sp. edit. ii. 1567 (Dill. Musc. tab. 62, fig. 6). *L. repens* Sw. *L. affine* Bory. *L. ericetorum* and *ambiguum* Schrad. *L. drepanoides* Blume.—Main stem trailing and rooting, varying in length from a couple of inches to a foot, bearing short distant trailing branches. Leaves secund, dimorphic, lanceolate,  $\frac{1}{6}$ – $\frac{1}{4}$  in. long, thin, pale green, those of the lower plane more or less falcate, those of the upper plane ascending. Peduncle stiffly erect, 2–12 in. long, stramineous, with lax adpressed rigid leaves. Spikes solitary, cylindrical, 1–3 in. long; bracts broad ovate, with a large spreading or ascending cusp.

Hab. On the ground in swamps. Throughout America, from the United States to South Brazil; also Guinea, Cape, Mascaren Isles, Ceylon, Hongkong, Malay Isles, New Guinea and Tasmania. The principal varieties are *L. paradoxum* Spring; Mart. Icon. Crypt. Bras. tab. 20, fig. 2. Brazil and New Granada, with oblique ovate leaves of the lower plane; *L. tuberosum* A. Br., Angola, with very acuminate leaves and sterile branches bearing tubercles; and *L. sarcocaulon* Welw., Angola and Cape, with very large thin falcate acuminate leaves  $\frac{1}{2}$  in. long.

91. *L. WIGHTIANUM* Wall. Cat. No. 2184. *L. Loureiri* Desv. ?—Stems wide-trailing, wiry, sparsely leafy; branches ascending, copiously compound, branchlets sometimes 3–4 in. long, flat,  $\frac{1}{8}$  in. diam. including the leaves. Leaves dimorphic, green, firm in texture; those of the lower plane very decurrent, with a free lanceolate arcuate-ascending blade, 1–12th in. long; those of the upper plane smaller, lanceolate, ascending, adpressed to the stem. Spikes solitary, sessile at the end of elongated branchlets, many to a branch, cylindrical, 1– $1\frac{1}{2}$  in. long; bracts ovate, with a squarrose cusp.

Hab. Neilgherries and mountains of Ceylon and Java. Closely allied to *complanatum* and *alpinum*.

92. *L. COMPLANATUM* Linn. Sp. edit. ii. 1567 (Dill. Musc. t. 59–69); Journ. Bot. 1882, t. 233, Fl. Dan. t. 2671.—Main stem hypogæous, trailing sometimes to a length of several feet; branches ascending, copiously compound; branchlets 1–2 inches long, 1–12 in. diam. including the distichous leaves. Leaves dimorphic, firm and rigid in texture, green; those of the lower plane with a very decurrent adnate base and short ascending free lanceolate point; those of the upper plane linear, erect, adpressed to the stem. Spikes several on a common peduncle from the axis of a branch, cylindrical, 1–2 in. long. 1–12th in. diam.; bracts broad ovate, ascending, shortly cuspidate.

Var. *L. thuyoides* H. B. K. in Willd. Sp. Plant. v. 18.—A luxuriant



variety with branchlets often 3-4 in. long and 8-10 spikes on a long peduncle.

Var. *L. Chamæcyparissus* A. Br. in Doell Rhein Flora 36; Fl. Dan. t. 2672.—Leafy branches less spreading, narrower, stiffer, nearly square. Leaves less distinctly dimorphic

Hab. North temperate zones of both hemispheres; also Madeira, Azores, Madagascar, Java, Sumatra, New Guinea, Tahiti and Tropical America, ascending in the Andes to 11,000 ft. Habit of *L. alpinum*, from which it differs by its dimorphic distichous leaves and peduncled spikes, *L. Chamæcyparissus* and *L. tristachyon* Presl. being connecting links between the two types.

93. *L. SCARIOSUM* Forst. Prodr. 87; Hook. Ic. t. 966. *L. decurrens* R. Br. *L. Lessonianum* A. Rich. *L. lindseaceum* Spring. *L. comptonioides* Desv. *L. Gayanum* Remy.—Stem trailing to a length of several feet; branches ascending, copiously compound,  $\frac{1}{2}$ -1 ft. long; branchlets ascending, flat including the leaves,  $\frac{1}{8}$ - $\frac{1}{6}$  in. diam. Leaves distichous, dimorphous, firm in texture, green, with a distinct midrib; those of the lower plane lax, very decurrent, ascending, lanceolate,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long; those of upper plane much smaller, lanceolate, erect, adpressed to the axis. Spikes solitary, sessile or peduncled at the end of the branchlets, often many to a branch, cylindrical, 1-2 in. long; bracts broad ovate, with a large finally squarrose cusp.

Var. *L. Jussiei* Desv. Encyc. Suppl. iii. 543; Hook. et Grev. Ic. t. 186. *L. Haenkei* Presl.—Branches erect, longer and more compound than in the type; branchlets  $\frac{1}{4}$ - $\frac{1}{3}$  in. diam. Spikes 1-5, on a long peduncle, mainly produced from the central axis of the branch.

Hab. New Zealand, the type. The Australian (Victorian Alps and Tasmania) plant is slightly different. *L. Jussiei* is widely spread over the Andes, extending also to Jamaica and Brazil. The Chilean *L. Gayanum* is intermediate between *Jussiei* and the type.

94. *L. VOLUBILE* Forst. Prodr. 86; Hook. et Grev. Ic. t. 170. *L. spectabile* Blume. *L. Durvillei* A. Rich.—Stems wide-scandent, wiry, stramineous; branchlets decompound; ultimate branchlets divaricate, sometimes 2-3 in. long,  $\frac{1}{6}$ - $\frac{1}{4}$  in. broad including the distichous leaves. Leaves very dimorphic, firm but thin in texture, pale green; those of the lower plane lanceolate,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long, with a broad adnate base, a distinct excurrent midrib and an oblique ascending point; those of the upper plane linear, adpressed to the stem. Spikes very abundant, cylindrical, pendulous, 1-3 in. long, 1-12 in. diam., forming ample panicles apart from the leaves; bracts ascending, imbricated, broad ovate, with a small cusp.

Hab. New Zealand, Polynesia, New Caledonia, N. Australia, and mountains of Java, Borneo, New Guinea and Penang, forming dense entangled masses on the margin of forests.

### 3. TMESIPTERIS Bernh.

*Sporangia* boat-shaped, 2-celled, 2-lobed, with the septum across the narrow diameter, opening by a slit down the apex from end to end (very rarely 3-lobed and 3-celled), adnate singly to the

base of bifid bracts, which resemble the leaves in texture. *Sporse* oblong, rather curved, with a single apical rib. A single species.

*T. TANNENSIS* Bernh. in Schrad. Journ. 1800, ii. 131, tab. 2, fig. 5; Labill. Pl. Nov. Holl. t. 252; Hook. et Bauer Ic. Fil. t. 86. *T. Forsteri* and *Billardieri* Endlich. *Psilotum truncatum* R. Br.—Rootstock creeping. Stems usually simple,  $\frac{1}{2}$ –2 ft. long, slender, angular, naked towards the base. Leaves moderately lax, lanceolate or oblong-lanceolate, produced on the upper side in the lower half, obtuse, mucronate,  $\frac{1}{2}$ –1 in. long, with a distinct midrib and decurrent base. Bracts taking the place of ordinary leaves, deeply bifurcate, shortly petioled. Sporangia  $\frac{1}{6}$ – $\frac{1}{4}$  in. long.

Hab. Australia, New Zealand and Polynesia.

#### 4. *PSILOTUM*\* Sw.

*Sporangia* rigidly coriaceous, turbinate, umbilicate at the apex, 3-lobed, 3-celled, splitting vertically down the centre of each lobe, placed singly free in the axils of rudimentary leaves all down the branches. *Spores* oblong, rather curved, one-ribbed. *Rootstock* wiry, short-creeping. *Stems* simple in the lower half, copiously dichotomously branched upwards. *Leaves* minute, laxly disposed, trifarious or distichous.

1. *P. TRIQUETRUM* Sw. Syn. Fil. 117; Schk. Crypt. t. 1656; Hook. et Bauer, Gen. Fil. t. 87; Fil. Exot. t. 63. *P. floridanum* Michx. *P. dichotomum* Link. *P. nudum* Griseb. *Bernhardia dichotoma* Willd. *Lycopodium nudum* Linn.—Whole plant  $\frac{1}{2}$ –2 ft. long, erect or suberect; branches triquetrous, many times dichotomously forked, the ultimate branchlets  $\frac{1}{4}$ – $\frac{1}{2}$  lin. diam. Leaves placed laxly on the angles of the branchlets, ovate, very minute, ascending, rigidly coriaceous. Bracts a little smaller than the proper leaves.

Hab. Tropical regions of both hemispheres, extending to Florida, Japan, and New Zealand. *P. capillare* Blume is a variety with indistinctly triquetrous branchlets. I include here *Bernhardia floridana*, *mariana*, *capensis*, *antillarum*, *indica*, *novæ-hollandiæ*, *mascarenica*, *ohuensis* and *Deppeana* of Karl Muller.

2. *P. COMPLANATUM* Sw. Syn. Fil. 188, 414, tab. 4, fig. 5; Schk. Crypt. t. 165b. *P. flaccidum* Wall. *P. Zollingeri* Cesati. *Bernhardia complanata*, *Schiedeana californica*, *ramulosa* and *Zollingeri* K. Muller.—General habit of *P. triquetrum* but pendulous and more laxly branched, the ultimate branchlets flat, with a distinct midrib, 1-12th to 16th in. broad, and the leaves and sporangia arranged distichously.

Hab. Similar in its distribution to the other species, but less common. *P. flaccidum* Wall. is a large lax variety, with broader branchlets than the type.

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\* For further information see an elaborate memoir by Count Solms Laubach, in vol iv. of the 'Annals of the Botanic Gardens of Buitenjorg,' p. 139, tabs. 18–23; and a paper by Karl Muller in Bot. Zeit. 1856, pp. 217, 233, tab. 7.

## Order 3.—SELAGINELLACEÆ.

*Sporangia* of two kinds, macrosporangia and microsporangia, not contained in any exterior wrapper, but placed in the axils of altered or unaltered leaves upon a produced or condensed stem, either free or imbedded in their substance, dehiscent or indehiscent, monoicous or rarely dioicous. *Microspores* very minute, dust-like, always very many in one microsporangium. *Macrospores* much larger, globose, generally chalk-white, few or many to each macrosporangium, furnished with three ribs which radiate from the apex and developing a minute female prothallium, which remains permanently attached to the spore. Two genera of very different habit.

1. SELAGINELLA (*P. B.*) Spring.\*

*Sporangia* minute, orbicular, laterally compressed, membranous, 1-celled, inserted in the axils of bracts so as to form a dense spike at the end of the leafy branches, the microsporangia numerous, the macrosporangia few and confined to the base of the spike. *Microsporangia* slitting across the top of the broad diameter, containing numerous dust like microspores. *Macrosporangia* usually also 2-valved, containing four or fewer macrospores.—Habit entirely of *Lycopodium*, from which it differs by its dimorphic spores and sporangia, some of the species small and fugacious, resembling *Hepaticæ*, with not more than two vascular bundles in the main stem. *Stems* copiously branched, the ultimate branching usually flabellato-dichotomous, trailing, suberect, sarmentose or scandent, with the root-fibres confined to the base, or in the trailing species extending to the upper nodes; in shape more or less distinctly quadrangular, the faces angled (stems goniotropous, Spring) or the faces flat (stems pleurotropous, Spring); nodes sometimes distinctly articulated. *Leaves* small, furnished only with a single central vein, usually tetrastichous and dimorphous, and more or less oblique, the two rows† of the lower plane larger and more spreading, the two rows of the upper ascending, adpressed to the stem and imbricated; in the subgenus *Euselaginella* multifarious, or, if tetrastichous, all alike. *Spikes* usually tetrastichous and often sharply square, but in two subgenera dimorphic on the same plan as the leaves, but mostly resupinate (*i. e.*, the small bracts on the same plane as the large leaves, and *vice versâ*).

\* For further information see Spring's elaborate Monograph in vol. 24 of the 'Memoirs of the Royal Academy of Belgium'; Hooker and Greville's "Enumeration," in Hooker's 'Botanical Miscellany,' vol. ii., p. 360, and vol. iii., 104; A. Braun's papers in the Reports of the Berlin Garden (especially that reprinted in Ann. Sc. Nat., 4th series, vol. 13. p. 54); Triana and Planchon's 'Cryptogamia of New Granada'; Kuhn's 'Filices Africanæ'; and in 'Monatsbericht der K. Preuss. Akad.,' April, 1865, pp. 185—209. This synopsis is reprinted, with additions and alterations, from Britten's 'Journal of Botany,' 1883—5.

† Spring distinguishes in the dimorphic-leaved species between *folia synedra*, in which the leaves are inserted on the angles of the stem, and *folia cathedra*, in which they are inserted on its faces.



## CLAVIS.

Subgenus 1. *SELAGINELLA* proper. Ordinary leaves all alike, multifarious. Bracts uniform.

Spikes not sharply square . Sp. 1-5

Spikes sharply square . . Sp. 6-8

Subgenus 2. *STACHYGYNANDRUM*. Ordinary leaves of two kinds and spreading in two planes, those of the upper plane smaller and more ascending. Bracts uniform.

Series I. *DECUMBENTES*. Dwarf species with the main stem decumbent and root fibres extending to its upper nodes.

Group 1. *Microphyllæ*. Persistent species, with leaves of firm or moderately firm texture, continuous stems, and leafy branches not more than 1-12th-1-8th in. broad.

Asiatic and European . Sp. 9-17

African . . . . Sp. 18-25

American . . . . Sp. 26-57

Group 2. *Plumosæ*. Persistent species, with leaves of firm or moderately firm texture, continuous stems and leafy branches  $\frac{1}{4}$ — $\frac{1}{3}$  in broad.

Asiatic and Australian . Sp. 58-65

African . . . . Sp. 66-74

American . . . . Sp. 75-101

Country unknown . . Sp. 102

Group 3. *Stoloniferæ*. Persistent species, with articulated stems (all but one American) . Sp. 103-120

Group 4. *Apodæ*. Fugacious species, mostly tropical annuals of the rainy season, with continuous stems.

Asiatic . . . . Sp. 121-126

African . . . . Sp. 128-129

American . . . . Sp. 130-151

Series II. *ASCENDENTES*. Stems ascending, branched down to the base, with the root-fibres confined to the nodes of the lower half.

Group 1. *Suberectæ*. Persistent species, with continuous stems, the leaves small, the leafy branches not more than 1-12th-1-6th in broad.

Asiatic and Polynesian . Sp. 152-158

American . . . . Sp. 159-161

Group 2. *Atrovirides*. Persistent species, with continuous stems, and broad leafy branches.

Asiatic . . . . Sp. 162-168

African . . . . Sp. 169

American . . . . Sp. 170-182

Country unknown . . Sp. 183

Group 3. *Articulatæ*. Persistent species, with articulated stems (all American) . Sp. 184-188

Group 4. *Radiatæ*. Fugacious species, mostly tropical annuals of the rainy season, with unjointed stems.

Old World . . . Sp. 182-195

New World . . . Sp. 196-203

Series III. *ROSULATÆ*. Stems densely tufted, curling up in drought, sometimes, but not always, branched down to the base, the root-fibres confined to the base.

Old World . . . Sp. 204-208

New World . . . Sp. 209-213

Series IV. *SARMENTOSÆ*. Persistent species, with elongated stems branched nearly or quite down to the base.

Asiatic and Polynesian . Sp. 214-224

American . . . Sp. 225

Series V. *SCANDENTES*. Persistent species, with wide-climbing continuous stems . . Sp. 226-228

Series VI. *CAULESCENTES*. Persistent species, with erect stems, simple in the lower part, decompound and frond-like upwards, the root-fibres confined to the base.

Group 1. *Flabellatæ*. Stems continuous.

Asiatic . . . Sp. 229-247

African . . . Sp. 248-251

American . . . Sp. 252-264

Group 2. *Geniculatæ*. Stems articulated (all American).  
Sp. 265-268

Subgenus 3. *HOMOSTACHYS*. Ordinary leaves of two kinds, and spreading in two planes. Bracts also dimorphous, the smaller bracts in the same plane as the smaller, more ascending leaves . . . Sp. 269-270

Subgenus 4. *HETEROSTACHYS*. Ordinary leaves of two kinds, and spreading in two planes. Bracts also of two kinds, but the spikes resupinate (*i. e.*, the smaller bracts in the same plane as the larger leaves, and *vice versa*).

Group 1. *Bisulcatæ*. Persistent species, with decumbent continuous main stems.

All Asiatic . . . Sp. 271-274

Group 2. *Pronifloræ*. Fugacious species, with decumbent continuous main stems.

Asiatic and Polynesian . Sp. 275-290

American . . . Sp. 291-294

Group 3. *Brachystachya*. Persistent species with continuous ascending stems.

Asiatic	.	.	.	.	295-297
African	.	.	.	.	298-299

Group 4. *Suberosa*. Fugacious species, with continuous ascending stems.

Asiatic and Polynesian	.	.	.	.	Sp. 300-318
African	.	.	.	.	Sp. 319-325
American	.	.	.	.	Sp. 326-334

### Subgenus I.—SELAGINELLA PROPER.

1. *S. SPINOSA* P. B. *Æthog.* 112. *S. spinulosa* A. Br. *S. selaginoides* Link. *Lycopodium selaginoides* Linn.; Schk. Krypt. t. 165; Hook. Brit. Ferns, t. 52; Eng. Bot. t. 1148. *L. ciliatum* Lam.—Barren stems short, trailing, slender, little branched, with short ascending branches. Leaves lax and spreading on the lower part of the barren branches, dense and ascending upwards, lanceolate,  $\frac{1}{2}$ –1 lin. long, acute, bright green, ciliated, thin but moderately firm in texture; midrib obscure. Fertile stems erect, simple, 2–3 in. long, with a leafy peduncle about as long as the spike. Spike multifarious; bracts lax, ascending, lanceolate or ovate-lanceolate,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, similar to the leaves in texture, strongly ciliated, not acutely keeled.

Hab. Arctic and temperate zones of Europe and North America, in damp places.

2. *S. DEFLEXA* Bracken. Fil. Amer. Expl. Expedit. 332, t. 45.—Stems tufted, flexuose, ascending, stramineous, 3–4 in. long, simple or little branched. Leaves multifarious, crowded, uniform, ovate or ovate-lanceolate, under a line long, acute, strongly reflexed, thin but firm in texture, conspicuously bristle-ciliated. Spikes 1–1 $\frac{1}{2}$  in. long,  $\frac{1}{8}$  in. diam., sessile; bracts similar to the leaves in shape, texture and ciliation, but larger, the lower patent, the upper ascending.

Hab. Sandwich Islands, *Dr. Hildebrand*

3. *S. PREISSIANA* Spring Mon. ii. 61. *Lycopodium gracillimum* Kunze Farnn. tab. 100, fig. 2. *L. musciforme* F. M.—Stems tufted, very slender, square, stramineous, erect, 1–2 in. long including the spike, usually simple. Leaves uniform, lax, spreading, decussate, lanceolate, about  $\frac{1}{2}$  lin. long, not ciliated, thin but moderately firm in texture, acute, with a distinct midrib. Spikes  $\frac{1}{2}$  lin. diam., reaching down nearly to the base of the stems; bracts ovate or ovate-lanceolate, ascending, imbricated, acutely keeled.

Hab. West Australia, Victoria, and Tasmania, in damp ground.

4. *S. ULIGINOSA* Spring. Mon. ii. 60. *Lycopodium uliginosum* Labill. Pl. Nov. Holl. ii. 154. t. 251.—Stems densely tufted, slender, pale, square, 3–12 in. long, with several ascending laxly pinnately arranged simple or forked branches in the upper half. Leaves lax, decussate, ovate or ovate-lanceolate,  $\frac{1}{2}$ –1 lin. long,



acute, thin but firm in texture, spreading or rather ascending, entire. Spikes copious, sessile at the end of the branches,  $\frac{1}{2}$ –1 in. long,  $1\frac{1}{2}$ –2 lin. diam.; bracts ovate or ovate-lanceolate, much imbricated, similar to the leaves in texture, acutely keeled.

Hab. East Australia, frequent from Queensland to Victoria and Tasmania, in swamps.

5. *S. PUMILA* Spring Mon. ii. 60. *Lycopodium pumilum* Schlecht. Adumb. 6. t. 3. *L. pygmæum* Kaulf.; Kunze Farnn. t. 100, fig. 1. *L. bryoides* Kaulf.—Stems tufted, very slender, stramineous, erect or decumbent, if the former not more than 2–3 in. long, simple or distantly pinnate, with short simple ascending branches. Leaves very lax, spreading, ovate or lanceolate, acute,  $\frac{1}{2}$ –1 lin. long, pale green, very thin and membranous in texture, not ciliated. Spikes terminal,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1–12th to 1–8th in. diam.; bracts deltoid, acute, imbricated, erecto-patent,  $\frac{1}{2}$  lin. long, convex on the back, but not acutely keeled.

Hab. Cape Colony, in shady and damp places. *L. pygmæum* Kaulf. is a form with short tufted erect stems and smaller narrower leaves; *L. bryoides* Kaulf. a form with longer trailing stems and broader larger less acute leaves.

6. *S. RUPESTRIS* Spring in Fl. Bras. i. 118. *Lycopodium rupestre* Linn.; Schk. Krypt. t. 165; Raddi Fil. Bras. t. 4 bis, fig. 2. *L. bryopteris* Wall., non Linn.; *L. Dregei* Presl.—Dill. Musc. t. 63, fig. 11. — Stems densely tufted, decumbent or ascending, reaching  $\frac{1}{2}$ –1 ft. long, with distant pinnately arranged simple or slightly compound branches. Leaves dense, multifarious, uniform ascending, densely imbricated, linear or linear-lanceolate,  $\frac{1}{2}$ –1 lin. long, with a distinct transparent awn, pale green, convex and sulcate on the back, rigid in texture, strongly ciliated. Spikes square, sessile,  $\frac{1}{2}$ –1 in. long,  $\frac{1}{2}$  lin. diam.; bracts rigid, ovate-lanceolate, acute, much imbricated, acutely keeled.

Hab. North and south temperate zone of both the Old and New Worlds; also on the Andes, Himalayas, and mountains of Brazil and Ceylon. The most widely spread species of the genus, but not known in Europe. Milde Fil. Eur. 262, defines ten varieties. *S. tortipila* A. Br., from the mountains of South Carolina, is a dwarf form with leaves more gibbous on the back, short cilia, and a sudden denticulate awn. *L. struthioloides* Nutt., from California, has also very thick short leaves and a sudden awn, combined with a suberect habit and and more compound branches than usual. *L. bryoides* Nutt. is a very dwarf form with decumbent main stems, with short close stout ascending leafy branches.

7. *S. OREGANA* Eaton in S. Wats. Bot. Calif. 350. — Stems pendent, flaccid, 1–6 feet long, pinnate, much branched. Leaves uniform, linear-lanceolate, green, convex and grooved on the back, sparsely denticulate, scarcely a line long, acute but not bristle-tipped. Spikes square, very slender, resembling the sterile branchlets.

Hab. Oregon, hanging from branches, in moist forests, in dense masses. Discovered by General Kautz in 1855.

8. *S. SANGUINOLENTA* Spring Mon. ii. 57. *Lycopodium sanguinolentum* Linn. Sp. 1567; Amoen. Acad. ii. 363, tab. 4, fig. 26. — Stems densely matted, often forked at the base, very slender,

bright red, spreading or ascending, reaching  $\frac{1}{2}$  ft. or more in length, copiously pinnately branched, the branches short, ascending and again compound. Leaves decussate, oblong, obtuse, with a minute cusp,  $\frac{1}{4}$  lin. long, ascending, thick in texture and convex on the back, pale green. Spikes  $\frac{1}{2}$ –1 in. long,  $\frac{1}{2}$  lin. diam., square; bracts thick, deltoid, acute,  $\frac{1}{4}$  lin. long, much imbricated, acutely keeled.

Hab. Eastern Siberia, in rocky mountainous situations, and discovered lately by Dr. Aitchison in the Kurram Valley, in Afghanistan.

## Subgenus II.—STACHYGYNANDRUM.

### Series I.—DECUMBENTES.

#### Group 1.—*Microphyllæ*.

9. *S. CÆSPITOSA* Spring Mon. ii. 90. *Lycopodium cæspitosum* Blume. — Stems very slender, trailing, matted, 2–3 in. long, pinnately branched, the branches slightly compound. \*Leaves of the lower plane close, suborbicular, obtuse,  $\frac{1}{2}$  lin. long, firm and rigid in texture, pale green, entire, subdecurrent on the upper side at the base, flat, with a distinct midrib; those of the upper plane much smaller, obovate, obtuse. Spikes unknown.

Hab. Mountains of Java. Most like *S. rotundifolia*, but the leaves are crowded and firmer in texture.

10. *S. MARIESII* Baker in Journ. Bot. 1883, 44. — Stems densely matted, very slender, trailing, 2–3 in. long, green or bright red, distantly pinnately branched, the branches slightly compound. Leaves of the lower plane spreading, spaced except the uppermost, oblique-oblong,  $\frac{1}{2}$  lin. long, obscurely pointed at the lower corner, moderately firm in texture, flat, with an obscure midrib, the upper side cordate and ciliated at the base, where it is imbricated over the stem, the lower rounded; leaves of upper plane half as long, oblique-ovate, subacute, ascending. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, much imbricated, strongly keeled.

Hab. Japan, in mountain woods, *Maries!* Midway between *denticulata* and *delicatissima*.

11. *S. VAGINATA* Spring Mon. ii. 87. — Stems densely matted, pale, trailing, 2–3 in. long, with distant erecto-patent slightly compound branches. Leaves of the lower plane close, erecto-patent, oblique ovate-lanceolate, acute,  $\frac{1}{2}$  lin. long, much incurved, firm in texture, ciliate-denticulate on all the edge, cordate and more conspicuously ciliated on the upper side at the base, where it is much imbricated over the rachis, a little rounded on the lower side; midrib obscure; leaves of the upper plane half as long, ascending, imbricated, ovate-cuspidate. Spikes copious, sessile, square,  $\frac{1}{8}$ – $\frac{1}{4}$  in. long,  $\frac{3}{4}$  lin. diam.; bracts ovate-lanceolate, strongly keeled.

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\* The descriptions of the leaves of the dimorphous species must be understood, unless it is otherwise expressly stated, to refer to those of the middle and lower part of the branches; not to those of the main stem, which, especially in the decompound species, often differ widely from those of the branches in shape and direction.

Hab. Bootan and Khasia Mountains, *Griffith!* Manipur, *Watt 5853!* Moulmein, *Parish 148!* Neilgherries, *Perottet!* *L. ciliare* Tayl, MSS. is a form with laxer more spreading leaves and longer cilia.

12. *S. DENTICULATA* Link, Fil. Berol. 159. *Lycopodium denticulatum* Linn. Sp. 1569 (Dill. Musc. t. 66, fig. 1 A).—Stems densely matted, pale, trailing, reaching a length of  $\frac{1}{2}$  ft., copiously pinnately branched, the lower branches copiously flabellately compound. Leaves of lower plane close or slightly spaced, broad ovate, oblique, subacute,  $\frac{3}{4}$ –1 in. long, spreading or erecto-patent, moderately firm in texture, flat, denticulate, cordate on the upper side at the base, much imbricated over the stem, rounded on the lower; leaves of upper plane half as long, oblique ovate, cuspidate, rather diverging. Spikes sessile, square, about  $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, much imbricated, strongly keeled.

Hab. Mediterranean region from Madeira and the Canaries to Syria. The Cape plant included here by Spring is a distinct species. *S. Kraussiana*, often called *denticulata* in gardens, is totally different. We have a specimen from the island of Elba with a distinctly platystichoid spike. The whole plant, in exposed places, sometimes turns bright red when old.

13. *S. MONGHOLICA* Ruprecht, Beitr. iii. 32.—Stems very slender, wiry, trailing, reaching a length of  $\frac{1}{2}$ –1 ft., copiously pinnately branched, the short branches copiously flabellately compound. Leaves of the lower plane crowded or rather spaced, erecto-patent, oblong, oblique,  $\frac{1}{2}$  lin. long, firm in texture, broadly rounded and ciliated on the upper side at the base, where it is imbricated over the stem; midrib distinct; leaves of the upper plane half as long, ascending, oblique oblong. Spikes sessile,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{3}{4}$  lin. diam., square; bracts deltoid, acute, crowded, with a raised keel.

Hab. North China; first gathered by Sir G. Staunton between Peking and Jehol. A near ally of *S. denticulata*. Var. *Rossii* Baker, from the province of Sching-king, differs by its spaced strongly deflexed leaves with revolute margins and bright crimson old stems. In exposed places the larger leaves are often wrapped round the branches, as in *vaginata*.

14. *S. HELVETICA* Link Fil. Hort. Berol. 159. *Lycopodium helveticum* Linn. Sp. 1568; Schk. Krypt. t. 165; Jacq. Austr. t. 196. *L. radicans* Schrank.—Stems densely matted, slender, pale, trailing, 2–3 in. long, forked at the base, distantly pinnately branched, with short erecto-patent slightly compound branches. Leaves of the lower plane spreading, close or slightly spaced, oblong or ovate-oblong,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. long, obtuse or subacute, oblique, produced on the upper side rounded on both sides at base, obscurely ciliated, flat, pale green, moderately firm in texture; leaves of the upper plane oblique ovate, acute,  $\frac{1}{2}$  as long, rather divergent. Spikes distinctly peduncled.  $\frac{1}{2}$ –1 in. long, 1 lin. diam., terete; bracts ovate, acute, imbricated,  $\frac{1}{2}$  lin. long, thin but firm, not acutely keeled.

Hab. Central Europe, and through Siberia to Persia, North China, and Japan.

15. *S. AGGESTA* Spring Mon. ii. 89.—Stems slender, trailing, densely matted, about an inch long, 2–3 times dichotomously forked. Leaves of lower plane spaced, except at the tip of the



branches, oblique ovate-lanceolate, obtuse or subacute,  $\frac{1}{2}$  lin. long, spreading, revolute, dark green, moderately firm in texture, broadly rounded on the upper side at the base, not ciliated; leaves of lower plane  $\frac{1}{3}$  as long, ovate, acute, ascending, imbricated, distinctly keeled. Spikes unknown.

Hab. Khasia Mountains, on rocks, *Griffith*.

16. *S. ORNITHOPODIODES* Spring Mon. ii. 93. *Lycopodium ornithopodioides* Linn. Sp. 1569, as regards the figure of Dillenius cited, Hist. Musc. t. 66, fig. 1B, but not the Ceylon plant. *L. hispidum* Willd.—Stems slender, pale, trailing, densely matted, 2–3 in. long, copiously pinnately branched, with short erecto-patent flabellately compound branches. Leaves of the lower plane close, oblique, ovate-lanceolate, about a line long, spreading, flat, acute, moderately firm in texture, the midrib distinct in the upper part, the base broadly rounded and distinctly ciliated on the upper side, less rounded and not ciliated on the lower; leaves of the upper plane  $\frac{1}{3}$  as long, oblique ovate, acute, ascending, imbricated. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, much imbricated, strongly keeled.

Hab. Khasia Mountains, *Hook. fil. & Thompson*! A near ally of *S. plumosa*, well represented in the figure of Dillenius above cited.

17. *S. ARABICA* Baker.—Stems trailing, wiry,  $\frac{1}{2}$  ft. long, sending out large wiry rootlets, densely intermatted; branches numerous, short, copiously compound. Leaves of the lower plane crowded, oblique ovate 1–12 in. long, firm in texture, green with a distinct white edge, produced and more rounded at the base on the lower side, distinctly ciliated at the very base only; leaves of the upper plane oblique ovate, cuspidate, strongly ciliated, about half as long. Spikes not seen.

Hab. Aden, *Hunter* 257! Intermediate between *S. denticulata* and *yemensis*.

18. *S. BARKLYI* Baker Fl. Maur. 522.—Stems densely tufted, decumbent, not more than an inch long, copiously compound. Leaves of the lower plane crowded, spreading, flat, oblong, obtuse,  $\frac{1}{2}$  lin. long, firm in texture, minutely ciliate-denticulate, nearly equal-sided, rounded on both sides at the base; leaves of the lower plane a third as long, obovate, cuspidate, much imbricated. Spikes  $\frac{3}{8}$ – $\frac{1}{4}$  in. long,  $\frac{1}{2}$  lin. diam., square; bracts deltoid-cuspidate, crowded, strongly keeled.

Hab. Round Island, off the coast of Mauritius, *Sir H. Barkly*! A near ally of *S. obtusa*.

19. *S. OBTUSA* Spring Mon. ii. 200. *S. viridula* and *pusilla* Spring. *Lycopodium obtusum* Desv. *L. pusillum* Desv. *L. viridulum* Bory. *L. umbrosum* Willd.—Stems trailing, pale, square, with an angled face, 2–4 in. long, copiously pinnately branched, the branches short, the lower deltoid, copiously compound. Leaves of the lower plane close, spreading, ovate-deltoid,  $\frac{3}{4}$ –1 lin. long, bright green, obtuse, moderately firm in texture, flat, very unequal-sided, minutely ciliate-denticulate, broadly rounded on the upper side at the base and much imbricated over the stem, cuneate-

truncate on the lower side; leaves of the lower plane a third as long, obovate, with a cusp nearly as long as the blade. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts deltoid-cuspidate, crowded, acutely keeled.

Hab. Mountain rocks of Mauritius, Bourbon, and Madagascar.

20. *S. MITTENII* Baker in Journ. Bot. 1883, 81.—Stems densely intermatted, trailing,  $1\frac{1}{2}$ –2 in. long, tripinnate, with several erectopatent main branches. Leaves bright green, moderately firm in texture, those of the lower plane cordate-ovate, subacute, 1-12th in. long, strongly denticulate all down the upper margin, with a central midrib, contiguous or rather imbricated on the branchlets; leaves of the upper plane a third as long, oblique ovate, acute. Spikes copious, 4-angled, not more than  $\frac{1}{6}$  in. long; bracts ovate-lanceolate, much imbricated,  $\frac{1}{2}$  lin. long, strongly keeled, conspicuously denticulate on the margins.

Hab. Usassura Mountains, Central Africa, *Bishop Hannington*!

21. *S. BALFOURII* Baker Fl. Maur. 522.—Stem trailing, densely matted, 3–4 in. long, forked low down, distantly pinnate, with short copiously compound lower branches. Leaves of lower plane spaced, except at the tips of the branchlets, patent, oblong, obtuse,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. long, entire, not ciliated, flat, rather rigid in texture, pale green, the lower edge parallel with the midrib, the upper convex and broadly rounded at the base; leaves of the upper plane a third as long, obovate-cuspidate, much imbricated, strongly keeled throughout. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, square,  $\frac{1}{2}$  lin. diam.; bracts orbicular-cuspidate, crowded, strongly keeled, not much longer than the sporangia.

Hab. Rodriguez, on the coralline limestone, *Dr. I. B. Balfour*! A near ally of *S. obtusa*.

22. *S. WELWITSCHII* Baker in Journ. Bot. 1883, 81.—Stems densely matted, trailing, 2–3 in. long, distantly pinnately branched, the lower branches slightly compound. Leaves of the lower plane crowded on the branches, ascending, ovate, acute, slightly unequal-sided,  $\frac{1}{2}$  lin. long, incurved, moderately firm in texture, ciliate-denticulate on all the margins, cordate and more strongly ciliated on the upper side at the base, rounded on the lower side; midrib distinct from base to tip; leaves of the upper plane a third as long, ascending, imbricated, ovate, acute. Spikes unknown.

Hab. Angola, on dry rocks of the Pedras of Pungo Andongo, *Welwitsch* 43! A close ally of *S. vaginata*.

23. *S. SOMALIENSIS* Baker in Journ. Bot. 1883, 82.—Stems wiry, wide-trailing, terete,  $\frac{1}{2}$ –1 ft. long, dichotomously forked, the forks copiously pinnate, the short distant branches copiously flabellately compound. Leaves of the lower plane crowded on the branchlets, patent, ovate-lanceolate,  $\frac{1}{2}$  lin. long, subacute or subobtuse, flat, not incurved, moderately firm in texture, not very unequal-sided, the midrib distinct, both sides, especially the upper, furnished with conspicuous unequal cilia, the upper side broadly rounded at the base and much imbricated over the rachis; leaves

of the upper plane half as long, ovate, acute, cuspidate, much imbricated. Spikes unknown.

Hab. Mountains of Somali-land, 1500—6000 ft., *Hildebrandt* 1484! A near ally of *S. mongholica* and *yemensis*.

24. *S. CATHEDRIFOLIA* Spring Mon. ii. 112. — Stems slender trailing, pale, flat on the face, reaching a length of  $\frac{1}{2}$ –1 ft., copiously pinnately branched, with copiously compound short branches. Leaves of the lower plane close, spreading, ovate, acute  $\frac{3}{4}$ –1 lin. long, bright green, flat, not very firm in texture, broadly rounded and strongly ciliated on the upper side at the base; leaves of the upper plane  $\frac{1}{3}$  as long, much imbricated, ovate, with a long cusp. Spikes square,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long,  $\frac{3}{4}$  lin. diam.; bracts crowded, ovate-lanceolate, acute, strongly keeled.

Hab. Upper Guinea at Princes Island, Fernando Po, Old Calabar, &c. Var. *minor* A. Br., gathered by Welwitsch in Angola on the hills of Pungo Adongo, differs by its shorter much less compound stems. A near ally of *S. ornithopodioides*.

25. *S. ECHINATA* Baker in Journ. Linn. Soc. inedit.—Stems decumbent, 3–4 in. long, copiously tripinnate; branches of all grades laxly disposed, erecto-patent; ultimate branchlets very short, 1–12th in. diam., leaves included. Leaves very dense, pale rigid, those of the lower plane erecto-patent, ovate or ovate-lanceolate, with a pale horny cusp, strongly ciliated; those of the lower plane narrower, densely imbricated, ascending, squarrose. Spikes not seen.

Hab. Central Madagascar, *Baron* 4426! A very distinct species.

26. *S. ARENARIA* Baker in Journ. Bot. 1883, 82.—Stems filiform, intermatted, very slender, trailing, angled on the face, 1–2 in. long, the ascending pinnately-arranged branches simple or forked. Leaves of the lower plane ascending and contiguous both on the main stem and branches, oblique broad ovate, acute,  $\frac{1}{2}$  lin. long, bright green, moderately firm in texture, more produced on the upper side of the midrib, cordate and ciliated on the upper side at the base and imbricated over the stem; leaves of the upper plane  $\frac{1}{3}$  as long, oblique ovate, acute, much imbricated. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. Cataract of Panuré, on the Rio Uapes, in sandy places liable to inundation, *Spruce* 2861!

27. *S. VALDEPILOSA* Baker in Journ. Bot. 1883, 82.—Stems slender, trailing, densely intermatted, 2–3 in. long, with several ascending irregular simple or slightly compound branches. Leaves of the lower plane spaced on the main stem, contiguous on the branches, ovate, acute, firm in texture, erecto-patent, subequilateral,  $\frac{1}{2}$  lin. long, conspicuously ciliated up to the apex, especially on the anterior border; leaves of the upper plane a third as long, oblique ovate, slightly imbricated. Spikes short, square,  $\frac{3}{4}$  lin. diam.; bracts ovate-lanceolate, suberect.

Hab. Demerara; ravine near the Kaieteur Savanna, *Jenman* 1484!

28. *S. TUBERCULATA* Spruce; Baker in Journ. Bot. 1883, 83.—Stems densely intermatted, trailing, filiform,  $\frac{1}{2}$ –1 in. long, with a



few spreading simple pinnately-arranged branches. Leaves of the lower plane ascending, the upper contiguous, the lower slightly spaced, ovate-oblong, quite obtuse, not more than  $\frac{1}{4}$  lin. long, bright green, moderately firm in texture, concave on the face, the midrib not reaching the tip, nearly equal-sided, the upper side cordate and distinctly ciliated at the base and imbricated over the stem; leaves of the upper plane  $\frac{1}{2}$  as long, oblique-ovate, acute, not cuspidate, much imbricated. Spikes not seen.

Hab. Rocks at the Panuré Falls, on the Rio Uapes, *Spruce* 2940! A very distinct and beautiful little species.

29. *S. BREVIFOLIA* Baker in Journ. Bot. 1883, 83. — Stems slender, trailing,  $1\frac{1}{2}$ –2 in. long, much intermatted, closely pinnate, the branches regularly erecto-patent, the lower considerably compound. Leaves of the lower plane crowded down to the base of the main stem, erecto-patent, oblique ovate, acute, not more than  $\frac{1}{4}$  lin. long, bright green, firm and rather rigid in texture, much dilated on the upper side of the midrib, nearly as broad as long, strongly ciliated and much imbricated over the stem on the upper side at the base; leaves of the upper plane  $\frac{1}{2}$  as long, oblique ovate, much imbricated, shortly cuspidate. Spikes sharply square,  $\frac{1}{3}$  lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Rio Negro, on rocks by the Janaraté cachoeira, forming large patches, *Spruce* 2547!

30. *S. BREVICAILIS* Baker in Journ. Bot. 1883, 83. — Stems densely tufted, procumbent,  $\frac{1}{2}$ –1 in. long, copiously branched. Leaves of the lower plane crowded, much imbricated, erecto-patent, linear-oblong, obtuse,  $\frac{1}{2}$  lin. long, green, moderately firm in texture, the midrib distinct and central, both sides conspicuously ciliated, the upper broadly rounded at the base and much imbricated over the rachis; leaves of the upper plane oblique ovate, acute, a third as long, much imbricated. Spikes very short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Eastern Cuba, near Monte Verde, *C. Wright* 941!

31. *S. MICROPHYLLA* Spring Mon. ii. 88. *S. thuyæfolia* Spring. *Lycopodium microphyllum* H. B. K. — Stems densely matted, trailing, 2–3 in. long, copiously pinnately branched, the lower branches copiously compound. Leaves scarcely dimorphous, those of the lower plane erecto-patent or adpressed to the stem, ovate, acute,  $\frac{1}{4}$  lin. long, dark green, firm in texture, nearly equal-sided, cordate, on both sides at the base, ciliated on both margins, the midrib obscure; leaves of the upper plane scarcely smaller, oblong, cuspidate, distinctly nerved, ascending, imbricated. Spikes  $\frac{1}{6}$ – $\frac{1}{8}$  in. long, square,  $\frac{1}{2}$  in. diam.; bracts crowded, ovate-cuspidate, strongly keeled.

Hab. Tropical America on mountain rocks; Guatemala, *Bernouilli* 955! New Granada, *Moritz* 369! *Lindig* 1519! Ecuador, *Spruce* 4787! Brazil, *Lindberg* 682! *Glaziov* 7967! Cordoba, *Hieronymus*! A near ally of *S. sanguinolenta*. I cannot help thinking that *S. Swartzii* Spring Mon. ii. 89, is this species, and the locality "India orientalis" a mistake.

32. *S. TENUISSIMA* Fée Fil. Bras. Suppl. 98 t. 108, fig. 1.—

Stems densely matted, trailing, 3-6 in. long, very slender, pale, angled on the face, forked, distantly pinnately branched, the branches little compound. Leaves of the lower plane decidedly spaced, spreading, pale green, rather rigid in texture, oblique oblong, subobtuse,  $\frac{1}{2}$  lin. long, much more produced on the upper side of the distinct midrib, rounded and shortly ciliated at the base on the upper side, not imbricated over the stem; leaves of the upper plane half as long, oblong, with a long cusp, but little imbricated. Spikes very short, nearly as broad as the leafy branches; bracts ovate cuspidate, strongly keeled.

Hab. Mountains near Rio Janeiro, *Glaziou* 4484! 4486! 4499! *S. serpens* Fée Fil. Bras., Suppl. 99, is a form of this and totally different from Spring's West Indian plant.

33. *S. LINDENII* Spring Mon. ii. 118. — Stems trailing, very slender, 3-6 in. long, subterete, pinnately branched, the branches short and but slightly compound. Leaves of the lower plane oblong-lanceolate, obtuse, crowded, spreading,  $\frac{3}{4}$ -1 lin. long, bright green, moderately firm in texture, more produced on the upper side of the distinct midrib, ciliated on the upper margin of the lower half, produced at the base on the upper side, and so much imbricated over the branch that it is quite hidden; leaves of the upper plane very small, ovate, acute, quite erect. Spikes very short, square; bracts ovate-lanceolate.

Hab. In Mexico, near Teapa, *Linden*! Like *S. jungermannioides* on a small scale.

34. *S. DELICATISSIMA* A. Br. in Ann. Sc. Nat. ser. 4. vol. 13, p. 60. — Stems densely matted, very slender, stramineous, trailing to a length of 6-12 in., forked and copiously pinnately branched, the branches copiously compound. Leaves of the lower plane spaced except at the tip of the branches, patent, oblong, obtuse, moderately firm in texture, more produced on the upper side of the distinct midrib, broadly rounded and densely ciliated on the upper side at the base; leaves of the upper plane  $\frac{1}{2}$  as long, oblong, acute, strongly auricled on the outer side at the base. Spikes unknown.

Hab. Frequent in cultivation, the native country not known, but probably Andine. Introduced by *Linden*. The leaves and tips of the branches curl up readily in drought.

35. *S. JAMESONI* Baker in Journ. Bot. 1883, 97. — Stems very slender, trailing, stramineous, 3-6 in. long, sulcate on both faces, forked and distantly pinnately branched, with slightly compound ascending branches. Leaves dimorphous, those of the lower plane lax except towards the tip of the branches, erecto-patent, ovate-oblong, subobtuse,  $\frac{1}{2}$  lin. long, moderately firm in texture, more rounded on the lower side of the distinct midrib, cuneate on both sides at the base, obscurely ciliated; leaves of upper plane half as long, oblong, acute, ascending. Spikes very short,  $\frac{3}{4}$  lin. diam.; bracts ovate, thin in texture, strongly keeled, acute, but not cuspidate.

Hab. Andes of Ecuador near Quito, *Jameson*! *Sodiro*! A near ally of *S. delicatissima*.

36. *S. PANURENSIS* Baker in Journ. Bot. 1883, 97. — Stems densely matted, 1–2 in. long, distantly pinnately branched, the branches simple or slightly compound. Leaves of the lower plane crowded, erecto-patent, oblong-lanceolate,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. long, obtuse or subacute, flat, moderately firm in texture, the distinct midrib nearly central, the base on the upper side not cordate nor imbricated over the stem, not ciliated; leaves of the upper plane half as long, oblong, acute, not cuspidate, much imbricated, strongly keeled. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate-lanceolate, crowded, strongly keeled.

Hab. Panuré, on the Rio Uapes, North Brazil, *Spruce* 2861!

37. *S. VESTIENS* Baker in Journ. Bot. 1883, 97. — Stems densely matted, about an inch long, forked and copiously pinnately branched, with short 2–3-furcate branches. Leaves of the lower plane crowded, oblong-lanceolate, acute, involute,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. long, green, moderately firm in texture, more produced on the upper side of the distinct midrib, ciliated on both sides near the base, the upper cordate and imbricated over the stem; leaves of the upper plane a third as long, ovate, acute, imbricated. Spikes short, copious, square,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam.; bracts ovate-lanceolate, crowded, strongly keeled.

Hab. Goyaz, on the Morro de Canto Gallo, on shaded rocks, *Burchell*!

38. *S. CLADOSTACHYA* Baker in Journ. Bot. 1883, 97. — Stems trailing, about an inch long, distantly pinnately branched, the short branches usually simple. Leaves of the lower plane ovate-lanceolate, subacute,  $\frac{1}{2}$  lin. long, moderately firm in texture, the midrib distinct, those of the main stem spreading and rather spaced, those of the branches crowded, ascending, imbricated, incurved, all the margin shortly ciliated, the upper near the base more distinctly so, its base cordate and so much imbricated over the stem that the latter is quite hidden; leaves of the upper plane half as long, ovate, acute, imbricated. Spikes very short; bracts ovate-lanceolate, strongly keeled.

Hab. Goyaz, on the Morro de Canto Gallo, with *S. vestiens*, *Burchell*!

39. *S. CAVIFOLIA* A. Br. in Ann. Sc. Nat., ser. 5, vol. iii., 272. — Stems very slender, pale, trailing, 2–3 in. long, flat on the faces, with numerous alternate pinnately-arranged simple or slightly compound erecto-patent branches. Leaves of the lower plane ascending, suborbicular, obtuse,  $\frac{1}{2}$  lin. long, pale green, firm in texture, flat, the midrib distinct, the edge denticulate, the upper half much more produced, cordate at the base and much imbricated over the stem; leaves of the upper plane half as long, oblong, acute, much imbricated. Spikes very short, 1 lin. diam.; bracts ovate, much imbricated, acute, not cuspidate, strongly keeled.

Hab. Andes of Bogota, *Lindig* 1511! Well marked by its trailing habit, nearly simple branches, and pale close orbicular rigid leaves.

40. *S. TRIFURCATA* Baker in Journ. Bot. 1883, 98. — Stems very slender, pale, trailing, 3–6 in. long, angled on the faces, regularly



pinnately branched, with short 2-3-furcate erecto-patent branches, Leaves of the lower plane close, spreading, ovate, acute, very oblique,  $\frac{1}{2}$  lin. long, flat, pale green, firm in texture, denticulate, much more produced on the upper side of the distinct midrib, the base cordate and much imbricated over the stem; leaves of the upper plane half as long, oblong, cuspidate, much imbricated. Spikes copious, short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, cuspidate, much imbricated, strongly keeled.

Hab. Panuré, on the Rio Uapes, *Spruce*! Habit of *serpens*, but totally different in the leaves.

41. *S. CRYPTOGEA* Baker in Journ. Bot. 1883, 99.—Stems slender, trailing, densely intermatted, 2-3 in. long, the erecto-patent branches simple or little compound. Leaves of the lower plane crowded even on the main stem, erecto-patent, oblique ovate, acute,  $\frac{1}{2}$  lin. long, bright green, moderately firm in texture, dilated, cordate, strongly ciliated and much imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblique ovate, acute, much imbricated. Spikes short, sharply square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, crowded, strongly keeled.

Hab. On the ground on the banks of the Rio Uapes, North Brazil, *Spruce* 2905! An ally of *S. radiata*, from which it differs by its short decumbent stems and crowded leaves.

42. *S. CAYENNENSIS* Baker.—Stems about 2 in. long, densely intermatted, very slender, copiously pinnate; branchlets  $\frac{1}{8}$  in. diam, Leaves bright green, moderately firm in texture; those of the lower plane contiguous on the branchlets, oblique oblong, obtuse,  $\frac{3}{4}$  lin. long, more produced and more rounded at the base of the upper side of the midrib; leaves of the lower plane half as long, much imbricated, ovate, acute. Spikes not seen.

Hab. French Guiana; cataract of Bradel, *Leprieur* 157!

43. *S. TARAPOTENSIS* Baker in Journ. Bot. 1883, 98.—Stems trailing, 3-6 in. long, subterete on back and face, copiously pinnate, the lower branches elongated and copiously compound. Leaves of the lower plane close or rather spaced, oblong-lanceolate, acute,  $\frac{3}{4}$ -1 lin. long, bright green, moderately firm in texture, more produced on the upper side of the distinct midrib, shortly rigidly ciliated in the lower half of the upper edge, broadly rounded at its base and somewhat imbricated over the branch; leaves of the upper plane half as long, suborbicular, with a very long cusp. Spikes copious, square,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, 1 lin. diam.; bracts very dense, ovate cuspidate.

Hab. In North West Peru on Mont Campana, and Mont Guayrapurima near Tarapota, *Spruce* 4625!

44. *S. ACANTHOSTACHYS* Baker in Journ. Bot. 1883, 99.—Stems very slender, trailing, angled on both back and face, 2-4 in. long, copiously pinnate, the branches copiously compound. Leaves of the lower plane oblong-lanceolate, acute,  $\frac{1}{2}$ - $\frac{3}{4}$  lin. long, bright green and moderately firm in texture, ascending, spaced, except at the tip of the branchlets, a little more produced on the upper side of

the distinct midrib, its edge shortly rigidly ciliated, its base very cordate and much imbricated over the branch; leaves of the upper plane  $\frac{1}{3}$ – $\frac{1}{2}$  as long, oblique ovate, cuspidate, incurved. Spikes copious, square,  $\frac{1}{2}$ –1 in. long,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam.; bracts ovate-lanceolate, rigid, very acuminate.

Hab. In North West Peru, on Mont Campana, *Spruce* !

45. *S. BRACHYCLADA* Baker. — Stems trailing, densely intermatted, 2–3 in. long, copiously pinnate; branches short and but little compound, 1–12–1–8th in. diam. Leaves bright green, thick and firm in texture; those of the lower plane close on the branchlets, oblique-ovate, 1–16th in. long, subacute, much produced on the upper side of the midrib, very cordate at the base and much imbricated over the stem; leaves of the lower plane half as long, broad ovate, ascending, imbricated. Spikes not seen.

Hab. British Guiana; foot of the Kaieteur, *Jenman* 1481 !

46. *S. JENMANI* Baker. — Stems trailing, densely intermatted, 3–4 in. long, copiously pinnate; lower branches with several short simple branchlets  $\frac{1}{8}$ – $\frac{1}{6}$  in. diam. Leaves bright green, moderately firm in texture, those of the lower plane close on the branchlets, very oblique ovate,  $\frac{3}{4}$ –1 lin. long, much produced on the upper side of the distinct midrib, very cordate at the base and imbricated over the stem, rounded at the base on the lower side and not imbricated over the stem; apex deltoid; leaves of the upper plane rather shorter, ovate, erecto-patent, strongly keeled. Spikes not seen.

Hab. British Guiana; foot of the Kaieteur, *Jenman* 1480 !

47. *S. BREVIPES* Fée Fil. Bras. 226, tab. 75, fig. 1. — Stems trailing, 4–6 in. long, flat on the back, convex on the face, copiously pinnate, the lower branches elongated and copiously compound. Leaves of the lower plane crowded, spreading or rather ascending, oblong-lanceolate, subacute,  $\frac{3}{4}$ –1 lin. long, bright green and moderately firm in texture, much more produced on the upper side of the midrib, shortly rigidly ciliated towards the base, where it is cordate and much imbricated over the branch; leaves of the upper plane  $\frac{1}{3}$ – $\frac{1}{2}$  as long, broad ovate, with a long cusp. Spikes square,  $\frac{1}{4}$ – $\frac{3}{4}$  in. long,  $\frac{3}{4}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. On the Tejuca Mountains, near Rio Janeiro, *Burchell* 3008 ! Serra das Orgaos, *Glaziou* 2241 !

48. *S. LINDBERGHII* Baker in Journ. Bot. 1883, 99. — Stems trailing, intermatted, 3–6 in. long, terete on the back, angled on the face, forked low down, copiously pinnate, the branches ascending, the lower copiously compound. Leaves of the lower plane close or slightly spaced on the branches, spreading, oblong-lanceolate, subacute,  $\frac{3}{4}$ –1 lin. long, more produced on the upper side of the midrib, with a strongly ciliated deeply cordate auricle on the upper side which reaches quite across the branch; texture moderately firm; upper border rather revolute; leaves of the upper plane a third as long, broad ovate, shortly cuspidate. Spikes copious,  $\frac{1}{2}$ –1 in. long, 1 lin. diam., square; bracts ovate, acute, strongly keeled.

Hab. Minas Geraes, Brazil, [*Lindberg* ! In St. Paulo, on the Serra de Cubatao, *Burchell* !

49. *S. INCURVATA* Baker in Journ. Bot. 1883, 99. *S. vaginata* Liebm., non Spring. — Stems trailing, 1–3 in. long, copiously pinnately branched, with short copiously compound cuneate erecto-patent branches. Leaves of the lower plane crowded, ascending, oblong-lanceolate, acute, at most a line long, moderately firm in texture, more produced on the upper side of the distinct midrib, shortly ciliated through the lower half of the upper edge, cordate at the base, so that the branch is hidden; leaves of the upper plane  $\frac{1}{3}$ – $\frac{1}{4}$  as long, ovate, much imbricated, shortly cuspidate. Spikes copious,  $\frac{1}{4}$  in. long,  $\frac{1}{2}$  lin. diam., not sharply square; bracts ovate-lanceolate.

Hab. Mexico, in the province of Vera Cruz, *Liebmann*!

50. *S. SERPENS* Spring Mon. ii. 102. *S. variabilis*, *varians*, *mutabilis* and *jamaicensis* Hort. *Lycopodium serpens* Desv. — Stems densely matted, quite trailing, reaching a length of 6–9 in., copiously pinnately branched, with numerous erecto-patent slightly compound branches. Leaves of the lower plane crowded, spreading,  $\frac{3}{4}$  lin. long, ovate-oblong, obtuse, bright green, moderately firm in texture, the distinct midrib nearly central, both sides rounded and ciliated at the base; leaves of the upper plane a third as long, oblique oblong, acute. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts broad ovate-cuspidate, crowded, strongly keeled.

Hab. West Indies. Cultivated in gardens since the days of Miller, and well known from the change that takes place in the colour of the leaves at different times of the day. Spring's Mexican plant is *S. Schiedeana*.

51. *S. REVOLUTA* Baker in Journ. Bot. 1883, 141. — Stems densely matted, trailing, 1–2 in. long, pale, angled on the face, copiously pinnately branched, with short slightly compound branches. Leaves of the lower plane spreading, moderately close, oblong-lanceolate, acute,  $\frac{1}{2}$  lin. long, moderately firm in texture, revolute, the midrib nearly central, the upper margin a little more convex than the lower, the edges ciliated; those of the upper plane a third as long, ovate, acute, much imbricated, strongly ciliated. Spikes very short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, much imbricated, strongly keeled.

Hab. Near Maypures and below San Fernando, on the banks of the Orinoco, *Spruce* 3621! Near *S. aggesta* of the Himalayas.

52. *S. PATULA* Spring Mon. ii. 97? *S. sarmentosa* A. Br. *Lycopodium patulum* Swartz? *L. nitidum* Hook. & Grev. — Stems slender, pale, trailing, reaching 6–9 in. long, angled on the faces, with a long whiplike tip and numerous short alternate pinnately arranged branches, with 3–7 branchlets. Leaves of the lower plane crowded, erecto-patent, oblong-lanceolate, subacute or subobtuse, bright green, moderately firm in texture, the midrib distinct, rounded, ciliated and imbricated over the rachis on the upper side at the base; leaves of the upper plane a third as long, oblique ovate, acute. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam., square; bracts ovate-cuspidate, much imbricated, strongly keeled.

Hab. Jamaica, *Bancroft*! *Wilson*! Common in cultivation. Marked at a glance from *S. serpens* by its caudate stem and fewer more compound branches.



53. *S. SCHIEDEANA* A. Br. in Ann. Sc. Nat., ser. 4, vol. xiii., 62. *S. fimbriata* Liebm., non Spring. *S. Liebmanni* Fourn. *S. serpens* Spring, *ex parte*.—Stems trailing, pale, square, flat on the face, reaching a length of half a foot, forked, copiously pinnately branched, the branches short, often with several branchlets. Leaves of the lower plane close or rather spaced, oblique oblong, rather ascending, bright green, flat, moderately firm in texture, subobtuse, ciliated, but little rounded and not imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblique ovate, cuspidate, imbricated. Spikes short, square; bracts ovate-lanceolate, much imbricated, strongly keeled.

Hab. In Mexico at Passantla, *Schiede* and *Deppe*, *Liebmann*! A near ally of *S. sertata*.

54. *S. SERTATA* Spring Mon. ii. 104. — Stems slender, pale, trailing, square, flat on the face, forked and copiously pinnately branched, with copiously compound branches. Leaves of the lower plane rather ascending, crowded or rather spaced on the branches, pale green, moderately firm in texture, oblique-lanceolate  $\frac{3}{4}$ –1 lin. long, flat, subacute, with a distinct midrib, the upper side but little rounded at the base and scarcely at all imbricated over the stem; those of the upper plane a third as long, oblique oblong, cuspidate. Spikes square  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin diam.; bracts ovate-lanceolate, acute, strongly keeled.

Hab. Nicoya and Panama, *Dr. Sinclair*! Although the stems are continuous, this has some of the root-fibres anticous. In general habit it closely resembles *S. plumosa*.

55. *S. SACCHARATA* A. Br. in Fil. Nov. Gran. 356. *S. sanguinolenta* Liebm., non Spring. *S. Spirillum* Liebm.—Stems trailing, subterete,  $\frac{1}{2}$ –1 ft. long, forked and copiously pinnately branched, the branches copiously compound. Leaves of the lower plane ovate or oblong, those of the branches crowded or rather spaced,  $\frac{1}{2}$  lin. long, obtuse, flat, moderately firm in texture, pale green, turning bright red when old, the distinct midrib nearly central, both sides decidedly cordate and strongly ciliated at the base, the upper imbricated over the stem; leaves of the upper plane half as long, oblique oblong, incurved, acute, much imbricated. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam., square; bracts crowded, ovate-lanceolate, strongly keeled.

Hab. Mexico, *Schaffner*! *Liebmann*! *F. Muller* 737! Curls up in drought, like *S. delicatissima*.

56. *S. DOUGLASHI* Spring. Mon. ii. 92. *L. Douglassi* Hook and Grev. *L. ovalifolium* Hook. and Grev. Ic. t. 177. — Stems trailing, 3–6 in. long, pale, subterete, forked low down, pinnately branched, with copiously compound lower branches. Leaves of the lower plane crowded or slightly spaced, rather ascending, pale green, firm in texture, broad oblong, obtuse, a line long, nearly flat, midrib obscure, both sides auricled and ciliated at the base, the upper much imbricated over the stem; leaves of the upper plane half as long, oblique oblong, cuspidate. Spikes  $\frac{1}{2}$ –1 in. long,  $\frac{1}{2}$ –1 lin. diam.; bracts deltoid, cuspidate, much imbricated, strongly angled on the back.

Hab. British Columbia, Oregon, and Washington territory. A well marked species.

57. *S. OVALIS* Baker in Journ. Bot. 1883, 143.—Stems slender, trailing, above a foot long, terete on the back, angled on the face, copiously distantly pinnately branched, the branches short, ascending, flabellately compound. Leaves of the lower plane ovate, acute, ascending,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. long, crowded on the branches, bright green, firm in texture, rather more produced on the upper side of the distinct midrib, shortly ciliated through the lower half of the upper margin, rounded on both sides at the base, not cordate on the upper, but so much imbricated over the branch that it is hidden; leaves of the upper plane a third as long, ovate, acute, convergent, much imbricated. Spikes unknown.

Hab. Rapids of the Rio Mauhes, Amazonas, North Brazil, Dr. Traill 1416 !

#### Group 2.—*Plumosa*.

58. *S. UNCINATA* Spring Mon. ii. 109. *Lycopodium uncinatum* Desv. *L. dilatatum* Hook. & Grev. *L. caesium* Hort. (Dill. Musc. tab. 65, fig. 7).—Stems weak, slender, pale straw-coloured, bisulcate on the face, trailing to a length of 1–2 feet, with a long excurrent tip, and alternate short pinnately arranged copiously compound branches. Leaves of the lower plane oblique oblong, subovate, 1–12th to 1–8th in. long, close or rather spaced on the branches, thin in texture, bright blue-green, rather more produced on the upper side of the distinct midrib, not ciliated, minutely petioled, both sides cordate at the base, the upper scarcely imbricated over the stem; leaves of the upper plane a third as long, oblique oblong, cuspidate, much imbricated. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long. square. 1 lin. diam.; bracts ovate-lanceolate, a line long, crowded, sharply keeled.

Hab. China. Well known in cultivation.

59. *S. SEMICORDATA* Spring Mon. ii. 107. *Lycopodium semicordatum* Wall. ex parte.—Stems trailing, slender, pale straw-coloured, often a foot long, bisulcate on the face, copiously pinnately branched, with short densely compound branches. Leaves of the lower plane contiguous, spreading or rather ascending, oblong-lanceolate, 1–12 to 1–8th in. long, subobtuse or subacute, paler green and not so firm in texture as in *plumosa*, nearly equilateral, the midrib distinct, the upper side not all dilated at the base, not imbricated over the stem, and not ciliated; leaves of upper plane a third as long, oblique oblong, cuspidate, much imbricated. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{3}{4}$ –1 lin. diam., square; bracts ovate, acute, strongly keeled.

Hab. Frequent in the East Himalayas, and gathered by Alexander at Chusan. *S. semicordata* of J. Scott's 'List of the Higher Cryptogams of the Calcutta Garden,' p. 63, is founded on a plant of Dr. Hamilton's, included by Wallich under his *L. semicordatum*, which I believe to be a form of *S. monospora* with slightly dimorphic bracts.

50. *S. AURICULATA* Spring Mon. ii. 108. *S. plumosa* Presl.—Stems trailing, about half a foot long, bisulcate on the face,

copiously pinnately branched, the branches but little compound. Leaves of the lower plane close, oblong-lanceolate, 1-12th to 1-8th in. long, about three times as long as broad, spreading or rather ascending, bright green, moderately firm in texture, nearly equilateral, the midrib distinct, the upper side obscurely ciliated, a little dilated at the base, and slightly imbricated over the stem; leaves of the upper plane a third as long, broad ovate, distinctly cuspidate. Spikes  $\frac{1}{2}$ -1 in. long, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, crowded, sharply keeled.

Hab. Philippines, *Cuming* 2013! A near ally of *S. plumosa*.

61. *S. AUSTRALIENSIS* Baker in Journ. Bot. 1883, 144. *S. concinna* Benth. Fl. Austral. vii. 678, non Spring.—Stems trailing,  $\frac{1}{2}$ -1 ft. long, forked at base, bisulcate on both back and face, pinnately branched, with copious compound branches. Leaves of the lower plane oblong-lanceolate, acute, 3-4 times as long as broad, spreading, close or rather spaced on the branches, 1-12th to 1-8th in. long, bright green, moderately firm in texture, the distinct midrib nearly central, the upper side but little dilated at the base and scarcely imbricated over the stem, obscurely ciliated; leaves of the upper plane  $\frac{1}{3}$ - $\frac{1}{4}$  as long, ovate, cuspidate, much imbricated. Spikes square,  $\frac{1}{2}$ -1 in. long,  $\frac{3}{4}$  lin. diam.; bracts crowded, ovate-lanceolate, acutely keeled.

Hab. In Queensland. at Rockingham Bay, and on the banks of the Daintree River, *Dallachy*! *Fitzalan*!

62. *S. BRISBANENSIS* Bailey Suppl. Queensl. Flora, 62. —Stems very slender, trailing, 2-3 in. long; branches short, distant, but little compound,  $\frac{1}{8}$  in. diam. Leaves bright green, moderately firm in texture; those of the lower plane spaced out on the branches, spreading or rather deflexed, oblique oblong, acute, 1-12th in. long, more produced on the upper side of the midrib and broadly rounded at the base; leaves of the upper plane very small, ovate, acuminate, ascending. Spikes very short; bracts foliaceous, ovate, acute, the lower much longer than the upper.

Hab. Queensland; banks of the Brisbane River, *Bailey*!

63. *S. BAKERIANA* Bailey Suppl. Queensl. Flora, 62. *S. leptostachya* Bailey, non A. Br.—Stems trailing, 6-9 in. long; lower branches copiously compound; branchlets over  $\frac{1}{8}$  in. diam. Leaves bright green, moderately firm in texture; those of the lower plane spaced on the branches, patent, oblong, obtuse, 1-12th in. long, cordate on the upper side at the base; those of the upper plane less than half as long, ovate, ascending, acute. Spikes very copious, slender, square, 1-2 in. long.

Hab. Queensland; banks of the Johnstone River, *Bailey*! Introduced lately into cultivation by Mr. Bernays, F.L.S.

64. *S. COMMERSONIANA* Spring Mon. ii. 110. —Stems trailing, reaching a foot in length, convex on the back, bisulcate on the face, pinnately branched, the branches copiously compound. Leaves of the lower plane crowded, subrigid, bright green, a line long, half a line broad, oblong-lanceolate, very acute, subequilateral, the base



on the upper side shortly ciliated, not dilated; leaves of upper plane ovate cuspidate, one-fourth as long. Spikes very short, square; bracts ovate-lanceolate, crowded, strongly keeled.

Hab. Philippines, *Commerson*.

65. *S. PLUMOSA* Baker in Journ. Bot. 1883, 144. *S. radicata* Spring Mon. ii. 114. *S. Roxburghii* Spring Mon. ii. 203. *S. praelonga*, *tetragonostachya*, and *pyrrhopus* Spring. *S. stolonifera* J. Scott, ex parte, non Spring. *Lycopodium plumosum* Linn. herb. *L. tetragonostachyum* Wall. *L. radiculatum*, *praelongum*, and *Roxburghii* Hook. & Grev.; Dill. Musc. tab. 66, fig. 10. — Stems pale, trailing,  $\frac{1}{2}$ –1 ft. long, often forked low down, copiously pinnately branched, the branches copiously compound, the faces generally flat, the root-fibres extending to the upper nodes. Leaves of the lower plane contiguous on the branches, spreading or rather ascending, bright green, moderately firm in texture, oblong- or ovate-lanceolate, acute, 1-12th to 1-8th in. long, much more produced on the upper side of the distinct midrib, ciliated on both sides at the base, cordate on the upper side and much imbricated over the stem; leaves of the upper plane half as long, ovate, cuspidate, much imbricated. Spikes copious, square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam.; bracts ovate-lanceolate, acute, strongly keeled.

Var. *S. monospora* Spring Mon. ii. 135. *S. rugulosa* Cesati; Dill. Musc. t. 66, fig. 8.—Habit more robust, the branches more compound, the upper part of the stem assurgent, the root-fibres usually confined to the nodes of the lower half. Leaves bright green,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long.

Var. *S. pallida* Spring Mon. ii. 116. *Lycopodium pallidum* H. & G.—Leaves shorter, more ovate, pale green.

Hab. Eastern Himalayas, and Mountains of the Indian Peninsula and Ceylon; Birma and the Malay Isles; and extending to South China, San Cristoval, *J. G. Veitch*! and Vanecolla, *C. Moore*! I cannot separate by any definite character *S. biformis* A. Br. (Philippines, *Cuming* 2016!). *L. praelongum* H. & G. is a form with long flaccid trailing stems, flagellate at the end, and all the branches short; *L. tetragonostachyum* Wall., a dwarf suberect form with leaves between those of the type and var. *pallida*. Spring's Bonin plant, mentioned under *pallida*, is *S. boninensis* Baker. Var. *Hamiltoni* Baker (*S. semicordata* J. Scott, Calc. List 63, non Spring) is a form of *monospora* with slightly dimorphous bracts, included by Wallich under the same number as Spring's plant. *S. flagellifera* Hort. Bull., recently introduced from Fiji, is, I think, a form of this species.

66. *S. AZORICA* Baker in Journ. Bot. 1883, 213. — Stems trailing, rooting nearly up to the tip, continuous, 2–3 in. long, with several short slightly compound branches. Leaves of the lower plane contiguous on the branches, oblique oblong, nearly equilateral, acute,  $\frac{1}{8}$  in. long, rounded at the base, serrulate from base to apex along both margins, moderately firm in texture, bright green; leaves of the upper plane much imbricated, more than half as long as the others, oblique oblong-lanceolate, cordate on the outer side at the base. Spikes not yet seen.

Hab. Mountains of the Azores, *Arruda Furtado*! Lately received at Kew in a living state.

67. *S. DEPRESSA* A. Br. in Ind. Sem. Hort. Berol. 1859, 21.

*S. denticulata* Spring, ex parte. *Lycopodium depressum* Sw.—Stems matted, trailing, 2–3 in. long, with a few mostly simple branches. Leaves of the lower plane spaced, spreading, oblong-lanceolate, subacute, flat, moderately firm in texture, 1–12th in. long, more produced on the upper side of the distinct midrib, very cordate, strongly ciliated and much imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, ovate, little imbricated. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam., not regularly square; bracts lanceolate-deltoid, a line long.

Hab. Cape, *Thunberg*, *Menzies*! Orange Free State, *Cooper*! Natal, *McKen*! This is quite distinct from the European *S. denticulata*, with which Spring combines it.

68. *S. GOUDOTANA* Spring Mon. ii. 91.—Stems trailing, caespitose, 3–6 in. long, pale straw-coloured, terete below, flat on the faces upwards, distichously branched, the flabellately compound branches under an inch long. Leaves of the lower plane ovate, acute, a line long,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. broad, light green, rather rigid and glossy, flat, erecto-patent, spaced except at the top of the branches, serrulate, much dilated on the upper side at the base; leaves of the upper plane one-fourth as long, ovate acuminate, straight, divergent. Spikes unknown.

Hab. Central Madagascar, near Antananarivo, *Goudot*. This has not been found yet by our English collectors, who have gathered about 200 vascular cryptogams in Central Madagascar.

69. *S. FISSIDENTOIDES* Spring Mon. ii. 111. *Lycopodium fissidentoides* Hook. & Grev.—Stems slender, trailing, pale straw-coloured, flat on the faces, copiously pinnately branched, the branches copiously flabellately compound. Leaves of lower plane ascending, crowded, lanceolate, acute, 1–12th to 1–8th in. long, moderately firm in texture, bright green, more produced on the upper side of the distinct midrib, shortly ciliated near the base on the upper side, where it is cordate and so much imbricated over the branch that the latter is quite covered; leaves of the upper plane a third as long,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam.; bracts crowded, ovate-lanceolate, strongly keeled.

Hab. Seychelles, Madagascar, Johanna Island, and Guinea. *S. amphirrhizos* A. Br., from Johanna Island, *Hildebrandt* 1808, seems to be a luxuriant form of this species. The Seychelles plant has shorter, paler, less lanceolate leaves than the Madagascar type.

70. *S. SURCULOSA* Spring Mon. ii. 147. — Stems wide-trailing, pale straw-coloured, irregularly angled, a foot long, copiously pinnately branched, the short cuneate branches copiously flabellately compound. Leaves of the lower plane crowded, lanceolate, very acute, 1–12th to 1–8th in. long, firm in texture, bright green, nearly equal on both sides of the distinct midrib, shortly ciliated through the lower half of the upper edge, which is a little produced at the base, and imbricated over the branch; leaves of upper plane a third as long, oblique oblong, with a long cusp, much imbricated. Spikes unknown.

Hab. Mountains of Bourbon, *Dr. I. B. Balfour*! May be a variety of *S. concinna*, from which it differs by its narrower, acute, nearly equilateral leaves.

71. *S. CONCINNA* Spring Mon. ii. 199. *Lycopodium concinnum* Swartz. *L. pectinatum* Lam., ex parte. *L. apiculatum*, *sinuosum* and *sparsifolium* Desv.—Stems trailing, reaching a foot or more in length, subterete, often forked low down, copiously pinnately branched, the lower branches cuneate and copiously flabellately compound. Leaves of the lower plane crowded, ascending, oblique oblong-lanceolate, 1-12th to 1-8th in. long, subacute, bright green, glossy, rigid in texture, more produced on the upper side of the distinct midrib, the base on the upper side shortly rigidly ciliated, and so much dilated that the branch is quite hidden; leaves of the upper plane one-third as long, oblique oblong, with a long cusp, much imbricated. Spikes  $\frac{1}{2}$ –1 in long, square, 1 lin. diam.; bracts ovate, cuspidate, crowded, strongly keeled.

Hab. Mountains of the Mascaren Islands, especially Mauritius; Spring's Neilgherry and Ceylon specimens are clearly both *S. plumosa*. I cannot separate *S. serrulata* Spring Mon. ii. 202 (*Lycopodium serrulatum* Desv.).

72. *S. SECELLARUM* Baker Fl. Maurit. 523.—Stems slender, trailing, about a foot long, bisulcate on the face, lengthened out and whip-like at the end, forked low down, pinnately branched, with short cuneate flabellately compound branches. Leaves of lower plane spreading or rather ascending, contiguous on the branchlets, spaced on the branches, oblong-lanceolate, 1-12th to 1-8th in. long, acute, pale green, moderately firm in texture, more rounded on the upper side of the distinct midrib, shortly ciliated on both sides low down, cordate on the upper side at the base and much imbricated over the branch; leaves of upper plane one-third as long, oblique oblong, cuspidate. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, square, 1 lin. diam.; bracts ovate, cuspidate, strongly keeled.

Hab. Island of Mahé, Seychelles, *Horne* 157!

73. *S. CUPRESSINA* Spring Mon. ii. 113, ex parte.—Stems trailing, quadrangular, 8-12 in. long, bisulcate on the face, the main branching pyramidal, the secondary pinnate, with the ends often excurrent, the branches pubescent and triquetrous. Leaves of the lower plane crowded, oblong-lanceolate, subfalcate, a line long, light green, the two sides nearly equally rounded at the base, the upper sometimes obscurely ciliated, the midrib sulcate so as to appear double; leaves of upper plane half as long, oblong or ovate, cuspidate. Spikes square  $\frac{1}{4}$ – $\frac{1}{2}$  in. long; bracts ovate, acutely keeled.

Hab. Bourbon. The Asiatic plant placed here by Spring is *S. biformis* A. Br., which is doubtfully distinct from *S. plumosa*.

74. *S. RODRIGUESIANA* Baker, Fl. Maurit. 523.—Stems trailing, slender, pale straw-coloured, bisulcate on the face, reaching a foot in length, often forked low down, alternately pinnately branched, with short cuneate branches, the lower with 5-7 branchlets. Leaves of the lower plane spaced, rather deflexed, oblong, obtuse, 1-12th to 1-8th in. long, bright green, not so firm in texture as *L. concinna*, more produced on the upper side of the distinct midrib, obscurely ciliated low down, narrowed obliquely to the base and but little imbricated over the branch; leaves of lower plane one-



third as long, oblique oblong, strongly nerved, with a short inflexed cusp. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts orbicular, cuspidate, little longer than the sporangia, strongly keeled.

Hab. Island of Rodriguez, *Dr. I. B. Balfour*!

75. *S. PLAGIOCHILA* Baker in Journ. Bot. 1883, 212.—Stems filiform, trailing, much intermatted, 3–4 in. long, flat on the back and face, the ascending simple slightly pubescent branches pinnately arranged, simple or slightly compound. Leaves of the lower plane all spaced, spreading, oblong, obtuse, bright green, thin in texture, flat, at most 1-12th in. long, the distinct midrib nearly central, the margin obscurely ciliated all round, not specially at the base, the base on both sides equally rounded, not imbricated over the branch; leaves of the upper plane very small, spaced, ovate, erect, not cuspidate. Spikes very short; bracts ovate, acute, strongly keeled,  $\frac{1}{2}$  lin. long.

Hab. Eastern Cuba, near Monte Verde, *C. Wright* 942! A near ally of *S. Homaliæ*.

76. *S. HOMALIÆ* A. Br. in Crypt. New Gran. 352.—Stems very slender, entirely trailing, angled on the back, much intermatted, 3–6 in. long, with ascending, distant, mostly simple branches. Leaves of the lower plane close or slightly spaced, spreading, oblong, obtuse, 1-12th in. long, bright green, moderately firm in texture, the distinct midrib nearly central, the upper edge ciliated and cordate at the base, and imbricated over the branch; leaves of the lower plane one-fourth as long, broad, ovate, acute. Spikes short,  $\frac{1}{2}$  lin. diam.; bracts ovate, cuspidate, strongly keeled.

Hab. Cataracts of Jaruma and Panuré, Upper Amazon, *Spruce* 2534! 2941! *Traill* 1437! A near ally of *S. jungermannioides*.

77. *S. JUNGERMANNIOIDES* Spring Mon. ii. 117. *Lycopodium jungermannioides* Gaudich. *L. marginatum* Raddi, ex parte.—Stems trailing, much intermatted, 4–6 in. long, with a raised face and a flat back, copiously pinnately branched, the branches simple or little compound. Leaves of the lower plane crowded, spreading, oblong, obtuse, 1-12th in. long, dark green, moderately firm in texture, dilated, broadly rounded and strongly ciliated on the upper side at the base, and much imbricated over the branch; leaves of the upper plane one-third as long, oblique ovate, shortly cuspidate, much imbricated. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Frequent in South Brazil *Gaudichaud*! *Glaziov* 7493! 7965! &c. I cannot separate specifically the Peruvian *S. applanata* A. Br. (*Lechler* 2405!). The Buenos Ayres *S. radiata* Spring, is probably this species; but Aublet's Guianan *Lycopodium radiatum*, of which there is a type specimen at the British Museum, is *S. increscentifolia* Spring.

78. *S. TRUNCATA* A. Br. in Ann. Sc. Nat. ser. 4, vol. xiii., 65.—Stems entirely trailing, slender, a foot long, bisulcate on the face, copiously pinnately branched, the branches with several short, ascending, pinnately arranged branchlets. Leaves of the lower plane crowded both on the branches and main stem, spreading, oblong, 1-12th to 1-8th in. long, very obtuse, dark green, rather firm in texture, the distinct midrib subcentral, both sides ciliated

towards the base, the upper rather produced at the base and imbricated over the branch; leaves of the lower plane oblique, ovate, one-third as long, minutely cuspidate, ciliated. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Andes of New Granada, *Karsten, Triana*. Eastern Peru, on Mount Guayrapurima near Taropoto, *Spruce* 2024! A near ally of *S. Breynii*.

79. *S. LONGICUSPIS* Baker in Journ. Bot. 1883, 241.—Stems 3–4 in. long, entirely trailing, terete on the face, flat or rather sulcate on the back, pyramidal in general outline, with a few erecto-patent slightly compound branches. Leaves of the lower plane spreading, close on the branches, rather spaced on the main stem, oblong-lanceolate, subacute, 1-12th to 1-8th in. long, bright green, and moderately firm in texture, the distinct midrib oblique, obscurely ciliated and rounded on the upper side at the base, a little imbricated over the branch; leaves of upper plane one-third as long, ovate, with a cusp as long as the lamina. Spikes short, square,  $\frac{3}{4}$  lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Rio Janeiro, on the Tejuca Mountains, *Glaziou* 7353! A near ally of *S. jungermannioides*, from which it may be readily known by the long cusps of the leaves of the upper plane.

80. *S. BREYNI* Spring Mon. ii. 119. *Lycopodium plumosum* Schk. Crypt. tab. 165, fig. 4 (Breyn. Exot. Cent.), tab. 100; Dill. Musc., tab. 66, fig. 9. — Stems entirely trailing, flexuose, often a foot long, flat on the back, bisulcate on the face, copiously pinnately branched, the central branches with 5–7 short pinnately arranged branchlets. Leaves of the lower plane spreading, crowded, linear-oblong, 1-6th to 1-5th in. long, obtuse, or obscurely pointed at the upper corner, dark green, moderately firm in texture, the distinct midrib nearly central, the upper side strongly ciliated and rather produced at the base, and a little imbricated over the branch; leaves of the upper plane one-fourth as long, oblique ovate, distinctly cuspidate, connivent, ciliated. Spikes  $\frac{1}{2}$ –1 in. long, square,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam.; bracts ovate-lanceolate, crowded, strongly keeled.

Hab. Guiana and Brazil, especially in the Amazon Valley. According to A. Braun, Haenke's plant from the Cordilleras of Chili,—referred to *Breynii* by Spring, *S. campyloides* A. Br. in Crypt. New Gran. 357, *Lycopodium atrovirens* Presl. in Rel. Haenk. i. 79, t. 12, fig. 2, non Wall.,—is a distinct species, marked by leaves of the lower plane auricled on the upper side at the base, and leaves of the upper plane with a caudate auricle on the outer side at the base.

81. *S. PLATYBASIS* Baker in Journ. Bot. 1883, 242. — Stem trailing, about a foot long, flat or sulcate down the face, copiously pinnately branched, the ascending branches cuneate, with 3–7 short flabellate branchlets. Leaves of the lower plane close, spreading, ovate-lanceolate, acute, 1-12th to 1-8th in. long, bright green, moderately firm in texture, the midrib distinct, the base on the upper side obscurely ciliated, dilated with a large auricle both laterally and downwards. so that those of the leaves of the opposite sides of the branch wrap over each other; leaves of the upper plane a third as long, oblique-ovate, with a short cusp. Spikes short, square, 1 lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. North Brazil, in moist caatingas near Panuré, *Spruce* 2502! General habit near that of *S. Breynii*, but leaves very different in shape.

82. *S. CALOSTICHA* Spring Mon. ii. 206. — Stem trailing, rather rigid, about a span long, strongly angled on both faces, pinnately branched, the branches little compound. Leaves of the lower plane crowded, ovate-lanceolate, subacute, 1-5th in. long, spreading, sub-rigid, not ciliated, the midrib subcentral, the base of the upper side rounded and a little dilated; leaves of the upper plane a third as long, ovate-lanceolate, with a long cusp. Spikes short, square; bracts ovate-lanceolate.

Hab. Mountains of Caracas, at 5000 ft., *Funk & Schlim* 3321.

83. *S. DENSIFOLIA* *Spruce* in Hook. 2 Cent. Ferns, t. 85. — Stem 4-6 in. long, decumbent, except at the tip, copiously pinnate, with assurgent sparingly compound branches. Leaves of the lower plane crowded both on the branches and main stem, oblong-lanceolate, 1-12th to 1-8th in. long, obtuse, more or less ascending, firm in texture, bright green, more produced on the upper side of the midrib, ciliated on both edges towards the base, cordate on the upper side and much imbricated over the branch; leaves of the upper plane a third as long, ovate, acute, not cuspidate, much imbricated. Spikes short, square,  $\frac{1}{3}$  lin. diam.; bracts acute-lanceolate, strongly keeled.

Hab. On the Orinoco, in damp shady places at Cerro de Morro, *Spruce* 3809!

84. *S. DENUDATA* Spring Mon. ii. 84. *Lycopodium denudatum* Willd. — Stems trailing, a span long, subterete, striated, irregularly branched, the very flaccid branches laxly sparingly branched. Leaves of the lower plane crowded towards the tip of the branchlets, spaced on the stem, ovate, subobtuse, a line long, horizontal, rather rigid in texture, not ciliated, subequilateral, subcordate on both sides at the base; those of the upper plane but little smaller, ovate, acute. Spikes short, square; bracts ovate-lanceolate, strongly keeled.

Hab. Jamaica, *Swartz*. I have not seen this.

85. *S. DIDYMOSTACHYA* Spring Mon. ii. 130; *Fée* Fil. Ant. t. 34, fig. 4. *Lycopodium didymostachyum* Desv. *L. denudatum* H. & G. — Stems trailing,  $\frac{1}{2}$ -1 ft. long, pyramidal in general outline, often forked low down, angled upwards on the face, copiously pinnate, the branches rhomboid and copiously compound. Leaves of the lower plane close on the branchlets, spaced on the stem, ascending, oblong, obtuse,  $\frac{3}{4}$ -1 lin. long, bright green, moderately firm in texture, more produced on the upper side of the midrib, where it is cordate at the base and much imbricated over the stem; leaves of the upper plane half as long, ovate, minutely cuspidate. Spikes  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, crowded, strongly keeled.

Hab. Mountain woods of Jamaica and San Domingo. There is a specimen in the Smithian Herbarium from *Swartz*, from Jamaica, of a dwarf variety with suborbicular close rigid leaves of the lower plane not more than  $\frac{1}{4}$  lin. long.



86. *S. GUATEMALENSIS* Baker in Journ. Bot. 1883, 243; Hemsl. Biol. Cent. Amer. Bot. t. 109 B. — Stems trailing, about  $\frac{1}{2}$  ft. long, pyramidal in general outline, convex on the face, flat on the back, copiously pinnate, the branches copiously compound. Leaves of the lower plane crowded, ascending, 1 lin. long, lanceolate, acute, bright green, moderately firm in texture, rather more produced on the upper side of the midrib, strongly ciliated at the base, and so much rounded and imbricated that the branch is quite hidden; leaves of the upper plane a third as long, oblique, oblong-lanceolate, shortly cuspidate. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{3}{4}$ –1 lin. diam.; bracts ovate-lanceolate, crowded, strongly keeled.

Hab. Guatemala, *Salvin & Godman!* *Bernouilli* 162! In Nicaragua at Chontales, *R. Tate!*

87. *S. PRODUCTA* Baker in Journ. Bot. 1883, 243. — Stems 6–12 in. long, trailing in the lower half, the end and branches assurgent, flat or terete on the back, bisulcate on the face, forked low down and copiously pinnately branched, with short ascending branches. Leaves of the lower plane spreading or ascending, close, oblong-lanceolate, subacute, 1–12th to 1–8th in. long, moderately firm in texture, much more produced on the upper side of the distinct midrib, very cordate, shortly ciliated at the base and imbricated quite across the branch; leaves of the upper plane oblique ovate, shortly cuspidate, imbricated. Spikes copious, square,  $\frac{1}{4}$ –1 in. long, 1 lin. diam.; bracts ovate, acute, much imbricated, strongly keeled.

Hab. British Guiana, *Appun!* *Drake!* *Jenman* 2325! Amazon Valley, *Spruce* 2043! Minas Geraes, *Lindberg!* Habit of *S. flexuosa*, from which it recedes by the very cordate upper base of the leaves of the lower plane. *Spruce* 4731, from the Rio Negro, comes midway between the two species. *Spruce* 2195, from the Falls of Sao Gabriel, differs from the type by its narrower and more decidedly acute leaves of the lower plane, which are also less cordate on the upper side at the base.

88. *S. SOLMSII* Baker. — Stems trailing, short, square, a foot long, copiously pinnate, branches ascending, with short compound lower branchlets. Leaves moderately firm, those of the lower plane contiguous both on the branches and branchlets, oblique oblong, obtuse,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, produced in the lower half on the upper side of the midrib, where it is broadly rounded at the base and imbricated over the stem; leaves of the lower plane small, ovate, ascending, with a large cusp. Spikes short, slender, square; bracts crowded, ovate, acute.

Hab. Guatemala; Costa Grande, *Bernouilli & Cario* 181! Received from Count Solms Laubach. A fine plant, allied to *S. flexuosa* and *producta*, with the largest leaves of any of this group.

89. *S. GUAYANENSIS* Spring Mon. ii. 134. — Stems decumbent, above a foot long, subterete, copiously pinnate, the branches but little compound. Leaves of the lower plane spreading, linear-oblong, middle-sized, subobtuse, three times as long as broad, nearly equal-sided, serrulate, subcordate and shortly ciliated on the upper side at the base; leaves of the upper plane very small,

cordate ovate, with a large cusp. Spikes square,  $\frac{1}{2}$  in. long; bracts ovate cuspidate, strongly keeled.

Hab. French Guiana, *Leprieur*. A near ally of *S. Gardneri*.

90. *S. GARDNERI* Spring Mon. ii. 134. *S. geminata* Fée Fil. Bras. Suppl. 100, tab. 108, fig. 4.—Stems  $\frac{1}{2}$ –1 ft. long, decumbent throughout, or assurgent in the upper half, copiously pinnate, moderately stout, flat on the back, convex on the face, the ascending branches copiously flabellate-pinnate. Leaves of the lower plane spreading, slightly spaced, nearly oblong, subobtuse, 1-12th to 1-8th in. long, dark green, firm in texture, minutely ciliated on both sides, very cordate on the upper side at the base and much imbricated over the stem; leaves of the upper plane half as long, imbricated, oblique ovate, with a distinct cusp. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam., square; bracts ovate-cuspidate, crowded, strongly keeled.

Hab. Organ Mountains, *Gardner* 5958! *Glaziou* 4484! 7282! In the type the root-fibres are confined to the nodes of the lower part of the stem. *S. ericoides* Fée Fil. Bras. 228, tab. 75, fig. 2, is a decumbent variety with shorter leaves and root-fibres extending to the upper nodes; and *S. macrostachya* Spring. Mon. ii. 133, is a suberect form, with unusually long spikes ( $\frac{1}{2}$ –1 in. long).

91. *S. FLEXUOSA* Spring Mon. ii. 131. *S. bella* Fée Fil. Bras. Suppl. 100, t. 108, fig. 3. *Lycopodium stoloniferum* Radd. Fil. Bras. 81, t. 2. *L. brasiliense* Desv.—Stems about a foot long, flat on the back, subterete on the face, copiously branched, the lower branches elongate and copiously compound, the upper part assurgent and root-fibres often only developed, from the lower half. Leaves of the lower plane close, spreading, bright green, oblong-rhomboidal, subacute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, moderately firm in texture, more produced on the upper side of the distinct midrib, serrulate on the upper side near the base, where it is rounded and a little imbricated over the branch; leaves of the upper plane a third as long, ovate, with a long cusp. Spikes  $\frac{1}{2}$ –1 in. long, square,  $\frac{3}{4}$ –1 lin. diam.; bracts ovate-lanceolate,  $\frac{1}{2}$  lin. long, crowded, sharply keeled.

Hab. Common in South Brazil.

92. *S. SEEMANNI* Baker in Journ. Bot. 1883, 244. — Stems trailing, about  $\frac{1}{2}$  ft. long, the root-fibres not extending to the upper nodes, 1-2-sulcate on the face, flat or terete on the back, pyramidal in general outline, copiously pinnate, the lower branches elongated, copiously compound. Leaves of the lower plane crowded on the branchlets, spreading or rather ascending, oblong-lanceolate, acute, 1-12th to 1-8th in. long, moderately firm in texture, rather more produced on the upper side of the distinct midrib, broadly rounded and ciliated at the base, and a little imbricated over the branch; leaves of the upper plane a third as long, ovate, imbricated, shortly cuspidate. Spikes short, copious, 1-1 $\frac{1}{2}$  lin. diam., not sharply square; bracts ovate-lanceolate,  $\frac{1}{2}$  lin. long.

Hab. Cacaqua, New Granada, *Seemann* 1006! A near ally of *S. flexuosa*.

93. *S. POLYCEPHALA* Baker in Journ. Bot. 1883, 332.—Stems trailing, a foot long, flat on the back, bisulcate on the face, copiously pinnate, the branches ascending and copiously compound.

Leaves of the lower plane close on the branches, ascending, oblique ovate, acute, 1-12th to 1-8th in long, pale green, moderately firm in texture, more produced on the upper side of the midrib, rounded and ciliated on the upper side at the base, and a little imbricated over the branch; leaves of the upper plane half as long, oblique ovate, acute, not cuspidate. Spikes copious, square,  $\frac{1}{2}$ -1 in. long,  $\frac{3}{4}$  lin. diam.; bracts ovate, acute, much imbricated, strongly keeled.

Hab. Mountains of Ocana, New Granada, at 5000-6000 ft., *Schlim* 493!

*Holton* 82! A near ally of *S. substipitata*.

94. *S. SUBSTIPITATA* Spring Mon. ii. 198. *S. straminea* Spring.—Stems trailing, reaching a foot in length, terete on the back, angled on the face, forked low down and copiously pinnate, with short erecto-patent copiously compound branches. Leaves of the lower plane touching on the branchlets, spaced on the main stem, ascending, oblique ovate, acute, 1-12th to 1-8th in. long, pale green, moderately firm in texture, more produced on the upper side of the midrib, shortly rigidly ciliated and very cordate at its base, much imbricated over the stem; leaves of the upper plane half as long, ovate, with a very long cusp. Spikes copious,  $\frac{1}{8}$ - $\frac{1}{4}$  in. long,  $\frac{1}{2}$  lin. diam., square; bracts ovate-cuspidate, strongly keeled.

Hab. West Indies. Guadeloupe, *L'Herminier*! *Husnot* 576! Porto Rico, *Schwanecke*! Dominica, *Imray*! Martinique, *Belanger* 381.

95. *S. SCHIZOBASIS* Baker in Journ. Bot. 1883, 333.—Stems trailing, a foot long, flat on the back, bisulcate on the face, copiously pinnate, with short erecto-patent, copiously compound rhomboid branches. Leaves of the lower plane ascending, close on the branchlets, much spaced on the main stem, oblong, obtuse, 1-12th to 1-8th in. long, pale, green and thin in texture, nearly equilateral, attached to the side of the stem, the base on the upper side not at all imbricated over it and not ciliated; leaves of the upper plane a third as long, oblique oblong, with a minute cusp. Spikes  $\frac{1}{4}$ - $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam., square; bracts ovate, acute, strongly keeled.

Hab. Mexico, in the province of Chiapas, *Dr. Ghiesbreght*, 605! A near ally of the Himalayan *S. semicordata*.

96. *S. FAUCIUM* Liebm.; Fourn. Fil. Mex. 148.—Stems quite trailing, a foot long, angled on the back, bisulcate on the face, copiously pinnate, with short copiously compound erecto-patent branches. Leaves of the lower plane ascending, close or slightly spaced, ovate-oblong, obtuse, 1-12th to 1-8th in. long, bright green and moderately firm in texture, minutely petioled, much more produced on the upper side of the midrib, not ciliated, cordate at the base and imbricated over the stem; leaves of the upper plane half as long, ovate, with a cusp as long as the lamina. Spikes  $\frac{1}{4}$ - $\frac{1}{2}$  in. long,  $\frac{3}{4}$  lin. diam., square; bracts ovate-lanceolate, very crowded, strongly keeled.

Hab. Mexico, at Huitamalea and Hacienda de Jova, *Liebm.*

97. *S. NICARAGUENSIS* Baker in Journ. Bot. 1883, 333; Hemsl. in Biol. Cent. Amer. Bot. t. 109A.—Stems trailing, above a foot



long, with a long whip-like end, flat on the back, bisulcate on the face, copiously pinnate, with short copiously compound ascending lower branches. Leaves of the lower plane ascending, contiguous on the branchlets, spaced on the main stem, oblong-lanceolate, subacute, 1-12th to 1-8th in. long, pale green, thin in texture, nearly equilateral, laterally attached and truncate at the base, not at all imbricated over the stem; leaves of the upper plane one-third as long, ovate, acute, not cuspidate. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam., square; bracts ovate, acute, crowded, strongly keeled.

Hab. Guatemala, in forests of Grenada, *Levy* 360! A near ally of *schizobasis* and *semicordata*.

98. *S. FENDLERI* Baker in Journ. Bot. 1883, 334. — Stems trailing, about a foot long, terete on the back, bisulcate on the face, the root-fibres not extending to the upper nodes, copiously pinnate, the short erecto-patent branches with several short pinnately arranged branchlets. Leaves of the lower plane oblique ovate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, close on the branches, much spaced on the main stem, spreading or rather ascending, pale green, moderately firm in texture, much more produced on the upper side of the midrib, where it is rather cordate at the base, strongly ciliated and a little imbricated over the branch; leaves of the upper plane one-third as long, oblique ovate, with a short cusp. Spikes copious, square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts crowded, ovate-cuspidate, strongly keeled.

Hab. Panama, at Chagres, *Fendler* 332!

99. *S. SUBSEGREGATA* Baker in Journ. Bot. 1883, 334. — Stems trailing, 6-9 in. long, nearly flat on both faces, the root-fibres not ascending to the upper nodes, copiously pinnate, the branches erecto-patent, the general outline pyramidal, the lower branches elongated and copiously compound. Leaves of the lower plane spaced, except towards the top of the branchlets, oblique ovate, acute, 1-12th to 1-8th in. long, bright green and moderately firm in texture, much more produced on the upper side of the distinct midrib, the upper edge shortly ciliated towards the base, which is very cordate and much imbricated over the branch; leaves of the upper plane half as long, oblique ovate, with a long cusp. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam., not sharply square; bracts ovate cuspidate, strongly keeled.

Hab. Rio Janeiro, *Glaziou* 4501! A near ally of *S. substipitata*.

100. *S. CAUDORHIZA* Baker in Journ. Bot. 1883, 334. — Stems trailing, above a foot long, lengthened out and whip-like at the tip, deeply sulcate on the face, flat on the back, copiously pinnately branched, the branches erecto-patent, the upper ones short, the lower elongated and copiously compound. Leaves of the lower plane oblong-lanceolate or lanceolate, acute, 1-12th to 1-8th in. long, close on the branches, ascending, nearly equal on both sides of the distinct midrib, truncate at the base, not at all imbricated over the stem, shortly ciliated through the lower half of the upper edge; leaves of the upper plane one-third as long, oblique ovate, shortly cuspidate, much imbricated. Spikes copious,  $\frac{1}{6}$ – $\frac{1}{4}$  in. long,

square,  $\frac{1}{2}$  lin. diam., often as if lateral; bracts ovate-lanceolate, strongly keeled.

Hab. Surinam. *Hostmann* 3! Allied to *faucium* and *semicordata*.

101. *S. LONGISSIMA* Baker in Journ. Bot. 1881, 208. — Stems trailing to a length of 2 ft. or more, the deltoid branches 6–9 in. long, with ascending simple upper and slightly compound lower branchlets, the ultimate divisions 2–2 $\frac{1}{2}$  in. long. Leaves of the lower plane close, obliquely attached, ovate-oblong, acute  $\frac{1}{8}$  in. long, the two sides not very unequal, the upper strongly ciliated at the base; leaves of the upper plane one-third as long, oblique ovate, nearly erect, obscurely cuspidate. Spikes terminal on the branchlets, square, 1–2 in. long, 1 lin. diam.; bracts ovate-lanceolate, erecto-patent, strongly keeled.

Hab. New Granada; Antioquia, 3300 ft. in forests, *Kalbreyer* 1815!

102. *S. METTENII* A. Br. Ind. Sem. Hort. Berol. 1867, App. 1; 1871, App. 9.—Stems slender, wide-trailing, distantly pinnate, the short branches flabellately compound. Leaves of the lower plane nearly contiguous on the branchlets, the upper ascending, the lower spreading, oblong, obtuse,  $\frac{1}{8}$  in. long, bright green, moderately firm in texture, nearly equal-sided, rounded on both sides at the base, not ciliated, not at all imbricated over the stem; leaves of the upper plane one-third as long, oblique ovate, acute, not cuspidate. Spikes square,  $\frac{1}{2}$  lin. diam.; bracts ovate-deltoid, gradually narrowed to the point, subentire.

Hab. Originally noticed in the Botanic Garden at Leipsic about 1865. Supposed to be a hybrid between *uncinata* and *inæqualifolia*.

### Group 3.—*Stoloniferae*.

103. *S. EXCURRENS* Spring Mon. ii. 214.—Stems trailing, very slender but firm, densely matted, jointed at the nodes, angled on both faces, excurrent and whip-like at the end, copiously pinnate, the short branches copiously compound. Leaves of the lower plane close on the branches, spreading, oblong-lanceolate subobtuse,  $\frac{1}{2}$  lin. long, bright green, firm in texture, more produced on the upper side of the midrib, obscurely ciliated, rounded on both sides at the base, laterally attached, not imbricated over the stem; leaves of the upper plane half as long, oblong, acute, much imbricated. Spikes not seen.

Hab. Central and South Brazil, and Banda Oriental, *For.* 125! *Tweedie* 573! Well-marked in the group by its small close leaves of firm texture.

104. *S. INTACTA* Baker in Journ. Bot. 1883, 335. — Stems slender, trailing, intermatted, jointed at the nodes, about a span long, acutely angled on back and face, copiously pinnate and irregularly forked, the branches distantly compound. Leaves of the lower plane spaced even on the branchlets, ascending, ovate- or oblong-lanceolate, acute, about  $\frac{1}{2}$  lin. long, rigid in texture, not ciliated, more produced on the upper side of the midrib, rounded at its base, clasping the stem obliquely; leaves of the upper plane

half as long, square,  $\frac{1}{3}$  lin. diam.; bracts ovate, acute, crowded, strongly keeled.

Hab. Andes of Ecuador, in woods of the temperate region at St. Nicholas, Sodiro! A well-marked species.

105. *S. DISTORTA* Spring Mon. ii. 212. — Stems slender, trailing or suberect, intermatted, 3–6 in. long, obscurely jointed at the nodes, suberect, copiously pinnate, the short ascending branches subflabellately compound. Leaves of the lower plane crowded on the branchlets, deflexed, oblong-lanceolate, acute, about  $\frac{1}{2}$  lin. long, firm and rather rigid in texture, more produced on the upper side of the midrib, at the rounded base of which they are shortly ciliated, but not imbricated over the stem; leaves of the upper plane more than half as long, imbricated, oblong, acute. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, strongly keeled.

Var. *major* Baker. — More luxuriant, with stouter stems reaching a foot or more in length and often excurrent at the end; leaves of lower plane often 1-12th in. long, spreading or rather ascending.

Hab. Mountains of Central and Soathern Brazil. Var. *major* (Burchell 6803! 8724! Glaziou 7355!) connects the type with *S. marginata*.

106. *S. STOLONIFERA* Spring Mon. ii. 209. *Lycopodium stoloniferum* Sw. *L. Poeppigianum* Hook. & Grev., ex parte. — Stems trailing, reaching a length of a foot or more, often excurrent and whip-like at the end, jointed at the nodes, angled on the back and face, copiously pinnate, with short copiously compound branches. Leaves of the lower plane close on the branchlets, rather ascending, oblong-lanceolate, acute, 1-12th to 1-8th in. long, rather rigid in texture, nearly equal-sided, laterally inserted, not imbricated over the back of the stem, shortly ciliated and more rounded on the upper side at the base, minutely auricled on the lower. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, strongly keeled.

Hab. West Indies; Cuba, Jamaica, San Domingo, Dominica, &c.

107. *S. MARGINATA* Spring Mon. ii. 211; Fl. Bras. i. 127, t. 7. *Lycopodium marginatum* H. B. K. — Stems trailing to a length of 2–3 ft., subterete, joined at the nodes, copiously pinnate, with short copiously compound alternate branches. Leaves close on the branchlets, spaced on the stem, rather ascending, oblong-lanceolate, acute, 1-12th to 1-8th in. long, rather rigid in texture, nearly equal-sided, not imbricated over the stem, with a spur-like auricle from the base on the upper side, which is shortly ciliated; leaves of the upper plane one-third to half as long, oblique ovate, not cuspidate. Spikes  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, square; bracts ovate-lanceolate, crowded, strongly keeled.

Hab. Guiana and Central Brazil. Humboldt's original specimen was gathered on the banks of the Orinoco, not in Mexico, as stated by Spring. A near ally of *S. stolonifera*.

108. *S. MACROCLADA* Baker in Journ. Bot. 1884, 23. — Stems entirely trailing, reaching a length of 2 ft. or more, jointed at the nodes, acutely angled on both back and face, excurrent at the end, furnished with numerous excurrent alternate pinnately arranged



branches, with contiguous simple erecto-patent branchlets. Leaves of the lower plane close both on branches and branchlets, more or less ascending, lanceolate or oblong-lanceolate, acute, 1-12th to 1-8th in. long, moderately firm in texture, more produced on the upper side of the midrib, where they are rounded and shortly ciliated, slightly imbricated over the stem, auricled at the base on the lower side; leaves of the upper plane half to one-third as long, oblique ovate, acute, much imbricated. Spikes not seen.

Hab. British Guiana, *Appun* 802! Well-marked from *stolonifera* and *marginata* by its plan of branching.

109. *S. POEPPIGIANA* Spring Mon. ii. 217, ex parte. *S. Martensii* Metten. in Lechler, Fil. Peruv. No. 2015, non Spring. *Lycopodium Poeppigianum*, Hook. & Grev., ex parte.—Stems trailing, 1-2 ft. long, forked at the base, jointed at the nodes, flat on the back, bisulcate on the face, copiously pinnate, with copiously compound erecto-patent branchlets. Leaves of the lower plane spaced except towards the tip of the branchlets, very much spaced on the main stem, spreading or rather ascending, oblong-lanceolate, subacute or subobtuse,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green and moderately firm in texture, more produced on the upper side of the midrib, broadly rounded on the upper side at the base, scarcely at all imbricated over the stem and not distinctly ciliated, not distinctly auricled on the lower side; leaves of the upper plane one-third as long, oblique oblong, with a distinct cusp. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate, sharply keeled.

Hab. Andes, from New Granada to Peru.

110. *S. KUNZEANA* A. Br. in Crypt. Nov, Gran. 380. *S. suavis* & *Poeppigiana* Spring, ex parte. *Lycopodium radiculosum* Kunze.—Stems trailing, a foot or more long, jointed at the nodes, flat on the back, bisulcate on the face, copiously pinnate, with copiously compound short erecto-patent branches. Leaves of the lower plane spaced even on the branchlets, ascending, lanceolate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green, moderately firm in texture, a little more produced on the upper side of the midrib, obscurely ciliated, rounded but not imbricated over the stem on the upper side at the base, distinctly auricled on the lower; leaves of the upper plane one-third as long, oblique ovate, cuspidate, imbricated. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{3}{4}$  lin. diam., square; bracts ovate-lanceolate, strongly keeled.

Hab. Andes, from New Granada to Peru. Very near *S. Poeppigiana*, from which it differs by its less unequal-sided leaves, distinctly auricled on the lower side at the base.

111. *S. CANESCENS* Fée Fil. Bras. 99. t. 108, fig. 2. —Stems trailing,  $\frac{1}{2}$  ft. long, flat on both back and face, pubescent, jointed at the nodes, copiously pinnate, with short flabellately compound cuneate branches. Leaves of the lower plane close on the branchlets, spaced on the main stem, oblong-lanceolate, acute, 1-12th to 1-8th in. long, more produced on the upper side of the midrib, broadly rounded, ciliated and imbricated over the rachis on the upper side at the base, not auricled on the lower; leaves of the

upper plane half as long, ovate-lanceolate, minute, much imbricated. Spikes not seen.

Hab. Rio Janeiro, *Glaziou* 4489!

112. *S. SUAVIS* Spring Mon. 216, ex parte; A. Br. in Crypt. Nov. Gran. 381.—*S. Glaziovii* Fée Fil. Bras. 232, tab. 75, fig. 4.—Stems trailing a foot or more long, flat on the back, bisulcate on the face, jointed at the nodes, copiously pinnate, with copiously compound short cuneate branches. Leaves of the lower plane close on the branchlets, spaced on the main stem, oblong-lanceolate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green and moderately firm in texture, more produced on the upper side of the midrib, broadly rounded and a little imbricated over the stem and shortly ciliated on the upper side at the base, distinctly auricled on the lower side; leaves of the upper plane a third as long, oblique ovate, with a long cusp, much imbricated. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, square,  $\frac{3}{4}$ –1 lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. Rio Janeiro, *Glaziou* 4482! 4502!

113. *S. SULCATA* Spring Mon. ii. 214. *Lycopodium sulcatum* Desv. *L. marginatum* Gaudich. *L. plumosum* Vellozo Fl. Flum. xi. t. 113. — Stems trailing in the lower half, usually assurgent in the upper half, flat on the back, deeply bisulcate down the face, jointed at the nodes, copiously flabellato-pinnate, the final branchlets contiguous. Leaves of the lower plane close on the branchlets, spaced on the stem, oblong-lanceolate, acute or subacute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green, moderately firm in texture, rather more produced on the upper side of the midrib, auricled on both sides at the base, obscurely ciliated on the upper side, not distinctly imbricated over the stem; leaves of the upper plane a third as long, oblique-ovate, with a long cusp. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, square,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam.; bracts ovate, acute, strongly keeled.

Var. *cruenta* Spring (*S. erythropus* Fée Fil. Bras. 230, non Spring) is a form with bright red stem and root-fibres. *S. Humboldtiana* A. Br. in Fil. Nov. Gran. 377, from the banks of the Orinoco, is said to differ from *sulcata* by its more flaccid texture, shorter base on the upper side of the leaves of the lower plane, and lower side with a longer auricle.

Hab. Common in South Brazil.

114. *S. AFFINIS* A. Br. in Crypt. Nov. Gran. 380. *S. Poeppigiana* var. *guyanensis* Spring Mon. 218. *S. rigida* Hort. — Stems a foot or more long, trailing, flat on the back, bisulcate on the face, jointed at the nodes, forked low down and copiously pinnate, with erectopatent copiously compound branches. Leaves of the lower plane close on the branchlets, ascending, oblong-lanceolate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green, moderately firm in texture, a little more produced on the upper side of the midrib, hardly at all imbricated over the stem, not ciliated and not distinctly auricled on either side at the base; leaves of the upper plane a third as long, oblique-oblong, cuspidate, imbricated. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, square, 1 lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. Guiana. A close ally of *S. Poeppigiana* and *Kunzeana*. A rare species in cultivation.

115. *S. SYLVATICA* Baker in Journ. Bot. 1884, 25. — Stems with the root-fibres confined to the lower half, about a foot long, jointed at the nodes, flat on the back, bisulcate on the face, copiously pinnate, with copiously compound erecto-patent branches. Leaves of the lower plane close only at the tip of the branchlets, the upper ascending, the lower patent, oblong-lanceolate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, almost membranous in texture, more produced on the upper side of the midrib, conspicuously ciliated at the base, broadly rounded and imbricated over the stem on the upper side, slightly auricled on the lower; leaves of the upper plane a third as long, oblique-oblong, with a long cusp. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, strongly keeled.

Hab. In shady woods near the town of Panama, *Seemann* 31!

116. *S. EURYNOTA* A. Br. in Crypt. Nov. Gran. 377. — Stems trailing, a foot or more long, jointed at the nodes, flat on the back, bisulcate on the face, copiously pinnate, the short erecto-patent branches copiously compound. Leaves of the lower plane spaced even on the branches, ascending on the branchlets, lanceolate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green and moderately firm in texture, nearly equal-sided, not distinctly auricled nor ciliated nor imbricated over the stem at the base; leaves of the upper plane a third as long, oblique-ovate, with a short cusp. Spikes copious, square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. Costa Rica, *Hoffmann* 907! Guatemala, *Bernouilli* 33! Empire State, common in damp places, *Sutton Hayes* 228! Chiriqui, *Hart*!

117. *S. MNIODES* A. Br. in Planch. and Trian. Crypt. Nov. Gran. 384. *S. ciliauricula* and *cirrhipes* Spring. *S. mnioides* Spring ex parte. *S. diffusa* Spring. *Lycopodium mnioides* Sieber. *L. diffusum* Presl. — Stems entirely trailing, reaching 1–2 ft. long, flat on the back, bisulcate on the face, forked low down and copiously pinnate, the ascending branches copiously compound. Leaves of the lower plane spaced even on the branchlets, very much so on the stem, spreading, ovate-oblong or oblong-lanceolate, subacute, 1–8th to 1–5th in. long, bright green, moderately firm in texture, more produced on the upper side of the distinct midrib, laterally attached, but slightly cordate and imbricated over the stem at the base, strongly ciliated and minutely auricled on both sides; leaves of the upper plane half as long, oblique-ovate, acute, not cuspidate. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, square,  $\frac{3}{4}$  lin. diam.; bracts ovate-acute, strongly keeled.

Hab. West Indies and Andes of Venezuela, New Granada, Ecuador, Bolivia, and Panama. The locality of Mauritius, given by Sieber for his type, is no doubt a mistake. *S. macrophylla* A. Br., l. c., from the Andes of Bolivia, seems to be a large luxuriant variety of this species.

118. *S. LINGULATA* Spring Mon. ii. 224. *S. microtus* A. Br. — Stems trailing, reaching a foot in length, slender, flat on the back, bisulcate on the face, jointed at the nodes, copiously pinnate, with elongated ascending laxly-compound branches. Leaves of the



lower plane spaced on the branchlets, very much so on the main stem, spreading, oblong, subobtuse,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green and moderately firm in texture, rather more produced on the upper side of the midrib, very obscurely ciliated, laterally attached and truncate at the base; leaves of the upper plane one-third to half as long, oblique oblong, acute. Spikes  $\frac{1}{4}$ – $\frac{3}{4}$  in. long, 1 lin. diam., square; bracts ovate lanceolate, crowded, strongly keeled.

Hab. Andes of Ecuador, *Jameson*! *Spruce* 4790! 5603! New Granada, *Sodirol*!

119. *S. LINDIGII* A. Br. in Crypt. Nov. Gran. 381. — Stems trailing, reaching a foot in length, flat on the back, bisulcate on the face, jointed at the nodes, copiously pinnately branched, the branches copiously compound. Leaves of the lower plane much spaced, spreading, oblong-lanceolate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, very unequal-sided, the lower margin parallel with the midrib, the upper rounded, laterally attached, truncate at the base, very obscurely ciliated; leaves of the upper plane half as long, oblong, acute, not cuspidate. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, square, 1 lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. Andes of New Granada, *Lindig* 1507! *Holton* 83! Ecuador, *Spruce* 4798! 5676! Scarcely more than a variety of *lingulata*.

120. *S. KRAUSSIANA* A. Br. in Ind. Sem. Hort. Berol. 1859, 22. *S. mnioides* Spring ex parte. *S. hortensis* Mett. *Lycopodium Kraussianum* Kunze. *L. denticulatum* Hort. — Stems trailing,  $\frac{1}{2}$ –1 ft. long, jointed at the nodes, flat on the back, subterete on the face, copiously pinnate, with copiously compound erecto-patent branches. Leaves of the lower plane contiguous on the branchlets, spaced on the branches and main stem, oblong-lanceolate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green, moderately firm in texture, a little more produced on the upper side of the midrib, ciliated and broadly rounded at the base, and a little imbricated over the stem; leaves of the upper plane a third as long, oblique ovate, acute, not cuspidate. Spikes short, square,  $\frac{3}{4}$ –1 lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Cape Colony, Natal, Fernando Po, Cameroon Mountains, Azores, Madeira, and reported also from Sicily. The commonest species in gardens, where it is often grown under the name of "*Lycopodium denticulatum*." *S. Brownii* Hort. Stansfield, is a dwarf variety from the Azores. I cannot distinguish from this species *S. remotifolia* Spring in Plant. Junghuhn. 276, from the mountains of Java, and *S. japonica* Miquel, Prolus. 349, from Japan, which has already been referred to *Kraussiana* by Franchet and Savatier.

#### Group IV.—*Apodæ*.

121. *S. SPINULOSA* Spring in Pl. Junghuhn. 277, non A. Br.—Stems very slender, trailing, 1–2 in. long, little branched. Leaves of the lower plane spaced even on the branchlets, oblong, obtuse,  $\frac{1}{2}$  lin. long, pale green, membranous, more rounded on the upper side at the base and strongly ciliated; leaves of the upper plane one-third to one-fourth as long, oblong, acute. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Java, *Zollinger* 2011! A near ally of *S. rotundifolia*.

122. *S. SAVATIERI* Baker in Journ. Bot. 1884, 87. *S. denticulata* Franch. & Savat. Enum. Jap. ii. 198, non Link.—Stems trailing, 2 in. long, sparingly pinnately branched, the branches erectopatent, the lower forked, the upper simple. Leaves of the lower plane spaced, spreading, a line long, oblique ovate, acute, pale green, rather firmer in texture than in *integerrima*, more produced on the upper side of the midrib, very cordate, shortly ciliated and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblique ovate, acute, not cuspidate. Spikes  $\frac{1}{2}$ –1 in. long,  $\frac{3}{4}$ –1 lin. diam., sometimes forked; bracts ovate cuspidate, similar in texture to the leaves, neither dense nor acutely keeled. Macrospores finely echinulate.

Hab. Japan, in the Island of Nippon, *Savatier*! Very near *nipponica*, from which it differs by its more cordate leaves and muricated macrospores.

123. *S. NIPPONICA* Franch. & Savat. Enum. Jap. ii. 199.—Stems trailing, 2–4 in. long, pinnately branched, the branches erectopatent, the upper simple, the lower slightly compound. Leaves of the lower plane contiguous upwards, spaced and spreading or rather deflexed on the lower part of the stem, oblique ovate or oblong, acute, a line long, pale green, firmer in texture than in *S. apus*, unequal-sided, more produced on the upper side of the midrib, slightly cordate, shortly ciliated and slightly imbricated over the stem at the base; leaves of the upper plane half as long, oblique oblong, acute, not cuspidate. Spikes  $\frac{1}{2}$ –1 in. long, 1 lin. diam.; bracts uniform or slightly dimorphic, similar to the leaves in texture, ovate cuspidate, not dense, nor strongly keeled.

Hab. Japan, in the Island of Nippon, *Thunberg*! *Savatier*! *Bissett*! Differs from *S. integerrima* mainly in its laxer, less acutely-keeled bracts. There is a specimen of this from Thunberg in the Smithian Herbarium, so that it is doubtless the *Lycopodium ornithopodioides* of his 'Flora Japonica.'

124. *S. INTEGERRIMA* Spring Mon. ii. 79. *L. integerrimum* and *ornithopodioides* Hook & Grev. — Stem trailing, very slender, reaching a length of  $\frac{1}{2}$ –1 ft., flat on the back, bisulcate on the face, irregularly forked low down, the pinnately arranged branches distant, short and but little compound. Leaves of the lower plane crowded and ascending on the branchlets, spaced and spreading or deflexed on the main stem, oblique oblong, subacute, 1–12th in. long, bright or pale green, membranous, more produced on the upper side of the midrib, not at all ciliated, rounded on both sides at the base, but only imbricated over the stem on the branchlets; leaves of the upper plane a third to half as long, oblique ovate. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1–1 $\frac{1}{2}$  lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. Ceylon, in the warmer parts of the island, *König*! *Gardner*! *Thwaites* 3280! This is the *Lycopodium ornithopodioides* of the Linnean Herbarium. We have closely allied plants from Japan, gathered by Oldham; from the Macalisberg Range, in South Africa, gathered by Sanderson; from Bourbon, gathered by Dr. I. B. Balfour, with leaves of upper plane narrower and shortly cuspidate; and from Chusan, gathered by Alexander, with more rigid smaller acute leaves of both kinds, which will likely prove distinct; but none of the specimens are in fruit, and they may be platystachyoid.

125. *S. EXIGUA* Spring Mon. ii. 238. *Lycopodium aristatum*

Roxb.? *S. aristata* J. Scott? non Spring.—Stems densely tufted,  $1\frac{1}{2}$ –2 in. long, very slender, decumbent, with slender root-fibres in the lower half, closely pinnate, with compound lower branches. Leaves of the lower plane crowded on the branches, spaced on the main stem, oblique ovate, acute, a line long, pale green, membranous, cordate and shortly ciliated on the upper side at the base and imbricated over the stem. Leaves of upper plane little smaller, oblique ovate, acute, shortly cuspidate. Spikes short, copious, 1 lin. diam.; bracts ovate, acute, strongly keeled, similar to the leaves in texture.

Hab. Assam and Mergui, *Griffith*! Resembles *S. proniflora* in leaves and general habit.

126. *S. PINANGENSIS* Spring Mon. ii. 205. — Stems entirely trailing, very slender, sulcate on the face, about  $1\frac{1}{2}$  ft. long, closely pinnate, the central branches with 3–4 short contiguous branchlets. Leaves of the lower plane close on both stem and branches, spreading, oblong, obtuse, 1–12th to 1–8th in. long, pale green, membranous, nearly equal-sided, rounded at both sides at the base, a little imbricated over the stem on the upper side, shortly ciliated through the lower half of the upper side; leaves of the upper plane a third as long, oblique ovate, with a cusp nearly as long as the blade. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Penang, *Gaudichaud*; Assam, *Jenkins*! Closely resembles *serpens* in general habit.

127. *S. TECTISSIMA* Baker in Journ. Bot. 1884, 89. — Stems filiform, trailing, intermatted, flat on the face,  $1\frac{1}{2}$ –2 in. long, the few short branches simple or little compound. Leaves of the lower plane spreading, contiguous or slightly spaced, ovate-deltoid, acute, bright green, membranous, not more than  $\frac{1}{2}$  lin. long, very unequal-sided, very cordate and strongly ciliated on the upper side at the base and much imbricated over the stem, the leaves of the opposite side considerably overwrapping each other; leaves of upper plane half as long, ovate, with a distinct cusp. Spikes short,  $\frac{1}{2}$  lin. diam., square; bracts ovate, acute, membranous, strongly ciliated, sharply keeled.

Hab. Macalisberg Mountains, along with the plant mentioned under *S. integerrima*, *Sanderson*!

128. *S. MACKENII* Baker in Journ. Bot. 1884, 89. — Stems filiform, trailing, intermatted, 3–4 in. long, sulcate both on back and face, forked low down, the few pinnate ascending branches simple or little compound. Leaves of the lower plane spreading, contiguous on the branchlets, spaced on the main stem, oblong, subacute, 1–12th in. long, pale green, membranous, more produced on the upper side of the midrib, cordate and shortly ciliated and a little imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblique ovate, acute, not cuspidate. Spikes very short, square, 1 lin. diam.; bracts ovate-lanceolate, membranous, strongly keeled.

Hab. Banks of the Tugela River, *Gerrard & McKen* 237! A near ally of *S. integerrima*.



129. *S. COOPERI* Baker in Journ. Bot. 1884, 89.—Stems intermatted, trailing, filiform, 2–3 in. long, flat on the back, bisulcate on the face, the few erecto-patent branches sparingly compound. Leaves of the lower plane contiguous and ascending on the branches, rather spaced and spreading on the main stem, oblong, acute, 1–12th in. long, membranous, rather unequal-sided, cordate, and strongly ciliated and imbricated over the stem on the upper side at the base; leaves of the upper side half as long, ovate, with a short cusp. Spikes  $\frac{1}{4}$  in. long, square, 1 lin. diam.; bracts ovate-lanceolate, membranous, strongly keeled in the upper half.

Hab. Orange Free State, *Cooper* 1056! Between *albo-nitens* and *integerrima*.

130. *S. ROTUNDIFOLIA* Spring Mon. ii. 85; Fee Fil. Ant. t. 34, fig. 2.—Stems very slender, trailing, intermatted, 2–4 in. long, the distant branches short and simple. Leaves of the lower plane spaced, spreading, suborbicular, cuspidate,  $\frac{1}{2}$  lin. long, pale green, membranous, nearly equal-sided, rounded on both sides at the base, shortly ciliated on the upper, not imbricated over the stem; leaves of the upper plane a third as long, ovate, acute, not cuspidate, not imbricated. Spikes very short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, membranous, strongly keeled.

Hab. West Indies; St. Vincent, Martinique, Guadeloupe, &c., *Husnot* 579!

131. *S. CARIBENSIS* Jenm. in Journ. Bot. 1886, 273.—Stems prostrate, very slender, 1–2 in. long, with a few short distant branches. Leaves membranous, pale green, those of the upper plane contiguous on the branchlets, suborbicular, obtuse  $\frac{1}{2}$  lin. long, subcordate at the base, produced, auricled and ciliated on the upper side; leaves of the upper plane ovate cuspidate, minute, not imbricated. Spikes about a line long; bracts lax, spreading, ciliated, not keeled.

Hab. Jamaica, in mountain forests, alt. 6000–7000 ft., *Morris* 502! A minute delicate species, allied to *S. rotundifolia*.

132. *S. OVIFOLIA* Baker in Journ. Bot. 1884, 90. — Stems filiform, trailing, 1–2 in. long, the distant branches short and simple. Leaves of the lower plane close, spreading, ovate, acute,  $\frac{1}{2}$  lin. long, bright green, membranous, nearly equal-sided, distinctly ciliated on both margins, rounded on both sides at the base, not imbricated over the stem; leaves of the upper plane one-fourth as long, oblique ovate, acute. Spikes very short,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, membranous, strongly keeled.

Hab. Porto Rico, *Schwanecke*! A near ally of *S. rotundifolia*.

133. *S. MACILENTA* Baker in Journ. Bot. 1884, 90.—Stems very slender, filiform, trailing, intermatted, 3–4 in. long, little branched, often excurrent and flagellate at the tip, with the leaves rudimentary. Leaves of the lower plane spaced, spreading, oblique ovate, acute,  $\frac{1}{2}$  lin. long, much more produced on the upper side of the midrib, broadly rounded on the upper side at the base, not imbricated over the stem; leaves of the upper plane one-fourth as long, oblique ovate, acute, not imbricated. Spikes short,  $\frac{1}{2}$  lin. diam.; bracts ovate-lanceolate, membranous, strongly keeled.

Hab. On stones at the foot of Mount Chimborazo, at an altitude of 3000 ft., *Spruce*! A near ally of *S. rotundifolia*.

134. *S. ARMATA* Baker in Journ. Bot. 1884, 90. — Stems filiform, trailing, 1–2 in. long, the distant pinnately arranged branches simple or forked. Leaves of the lower plane contiguous and ascending towards the tip of the branches, spaced and spreading on the main stem, ovate or oblong, acute,  $\frac{1}{3}$  lin. long, conspicuously ciliated on both sides from base to tip, pale green, membranous, rather more produced on the upper side of the midrib, cordate at the base and imbricated over the stem; leaves of the upper plane half as long, oblique oblong, acute, strongly ciliated. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate-lanceolate, strongly keeled, conspicuously ciliated.

Hab. Cuba, *Wright* 3908!

135. *S. CUNNINGHAMI* Baker in Journ. Bot. 1884, 110. — Stems trailing, 3–6 in. long, copiously pinnate, the lower branches considerably compound. Leaves of the lower plane contiguous and ascending on the branchlets, rather spaced and spreading on the stem, oblique ovate or oblong, subacute,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. long, bright green, membranous, very unequal-sided, very cordate and shortly ciliated on the upper side at the base and much imbricated over the stem; leaves of the upper plane half as long, oblique ovate, with a distinct cusp. Spikes copious,  $\frac{1}{4}$ – $\frac{3}{4}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate-lanceolate, crowded, strongly keeled.

Hab. Rio Janeiro, *Prof. Cunningham*! *Glaziov* 5217! 7039!

136. *S. RHODOSPORA* Baker in Journ. Bot. 1884, 111. — Stems very slender, entirely trailing, copiously pinnate, the lower branches compound. Leaves of the lower plane spaced, spreading, oblong, acute,  $\frac{1}{2}$  lin. long, bright green, membranous, nearly equilateral, conspicuously ciliated on both edges, cordate on the upper side at the base, and imbricated over the stem; leaves of the upper plane half as long, oblique ovate, with a large cusp. Spikes short, copious,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, crowded, strongly keeled in the upper half.

Hab. Eastern Cuba, *Wright* 1824!

137. *S. MORITZIANA* Spring Mon. ii. 249. — Stems trailing, intermatted,  $\frac{1}{2}$ –1 ft. long, flat on the back, flat or sulcate on the face, copiously pinnate, the lower branches often considerably compound. Leaves of the lower plane spaced and spreading even on the branches, oblique ovate, acute, a line long, bright green, firmer in texture than in *apus* and *brasiliensis*, unequal-sided, more produced on the upper side of the midrib, slightly cordate and shortly ciliated on the upper side at the base, and a little imbricated over the stem; leaves of the upper plane half as long, oblique ovate, acute. Spikes short, 1 lin. diam.; bracts uniform or slightly dimorphic, ovate-lanceolate, strongly keeled.

Hab. Andes of Venezuela, New Granada, and Ecuador, ascending to 10,000 ft. A near ally of *S. apus* and *brasiliensis*. In Crypt. Nov. Gran. p. 367, A. Braun defines six varieties. *S. porphyrospora* A. Br. Crypt. Nov. Gran. 369, gathered in Mexico by Sartorius, differs from *Moritziana* by having branches with excurrent whip-like ends, like those of *flagellata* and *cladorhizans*.

138. *S. DENDRICOLA* Jenman. — Stems trailing, 3–6 in. long, copiously pinnate; branches distant, short, spreading, simple or forked. Leaves membranous, bright green; those of lower plane spaced out, erecto-patent, oblique broad ovate, 1–16th in. long, produced on upper side of distinct midrib, and broadly rounded at base; those of upper plane half as long, ascending, broad ovate, cuspidate. Spikes copious, slender, square, erecto-patent from the main stem, an inch long; bracts ovate, acute, sharply keeled.

Hab. British Guiana; Essequibo and Macourea Rivers, on prostrate logs, *Jenman* 2323!

139. *S. EXPANSA* Sodiro Recens. Crypt. Vasc. Quit. 95. — Stems slender, trailing, diffusely branched from the base; branches short, the lower bipinnate. Leaves light green, those of the lower plane spaced out except at the tip of the branchlets, patent, obliquely attached, unequal-sided, acute, rounded on the upper margin and minutely auricled at the base, adnate to the stem on the lower; leaves of the upper plane ovate-lanceolate, unequal-sided, slightly falcate, prominently keeled. Spikes short, square; bracts ovate, acuminate, distinctly keeled.

Hab. Andes of Ecuador, *Sodiro*.

140. *S. BRASILIENSIS* A. Br. in Crypt. Nov. Gran. 374. *S. crassinervia*, *polysperma*, and *apus*, ex parte Spring. *S. apus* Fée Fil. Bras. Suppl. 98. *S. Beyrichii* A. Br. *Lycopodium brasiliense* Raddi Fil. Bras. 82, tab. 1, fig. 4. *L. patulum* Gaudich, non Sw. — Stems trailing, 2–4 in. long, copiously pinnate, the branches erecto-patent, the upper simple, the lower slightly compound. Leaves of the lower plane spaced and spreading, except towards the tip of the branches, oblique oblong, acute,  $\frac{3}{4}$ –1 lin. long, bright green, membranous, more produced on the upper side of the midrib, cordate at the base on the upper side, distinctly ciliated and imbricated over the stem; leaves of the upper plane half as long, oblique oblong, with a distinct cusp. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate-lanceolate, strongly keeled in the upper half.

Hab. Common in the southern half of Brazil, from Bahia and Minas Geraes to Santa Catherina. A near ally of *S. apus*. *S. polysperma* Spring is a form with short stems and copious long spikes. *S. anocardia* A. Br. in Fil. Nov. Gran. 374, is said to differ from *brasiliensis* by its more remote, more obtuse leaves of the lower plane; leaves of the upper plane with a shorter cusp and anticous bracts not so acuminate, and furnished with a broad keel, which is strongly toothed in the upper part.

141. *S. LUDOVICIANA* A. Br. in Ann. Sc. Nat. 4 ser., xiii. 58. *S. apus* var. *denticulata* Spring Mon. ii. 77. — Stems slender, copiously pinnate, flat on both back and face, reaching a length of half a foot, the upper branches simple, the lower slightly compound. Leaves of the lower plane much spaced below the tip of the branches, spreading, ovate-oblong, subacute, firmer in texture than in *apus*,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. long, serrulate, not distinctly ciliated, more produced on the upper side of the midrib, broadly rounded at the base, and imbricated over the stem; leaves of the upper plane half as long, oblique oblong, cuspidate. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate-lanceolate, a line long, strongly keeled.



Hab. Alabama and Louisiana, *Drummond* 485. A near ally of *S. apus*. Well known in cultivation.

142. *S. BINERVIS* Liebm. *S. sarmentosa* Liebm., non A. Br. *S. Moritziana* Fourn. Crypt. Mex. 148, vix Spring.—Stems trailing, 2–4 in. long, copiously pinnate, the short erecto-patent branches mostly simple. Upper leaves of the lower plane close, erecto-patent; lower spaced, spreading, ovate, acute, at most a line long, firm in texture for this group, more produced on the upper side of the midrib, spuriously 2-nerved, very cordate, shortly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblique ovate, with a long cusp. Spikes short, under 1 lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. Mexico, *Liebm.*! A near ally of *S. Moritziana*, with which Fournier unites it.

143. *S. MUSCOSA* Spring Mon. ii. 100.—Stems slender, flaccid, twisted, trailing, tufted, 3–4 in. long, copiously pinnate, the lower branches sparingly compound. Leaves of the lower plane spaced, ovate, subobtuse, a line long, unequally spreading, sometimes inflexed or reflexed, subcordate on both sides at the base, more produced on the upper, minutely ciliated, and imbricated over the stem; leaves of the upper plane scarcely smaller, curved, convergent, aristate. Spikes short, square; bracts ovate acuminate, strongly keeled.

Hab. Damp woods at Rio Janeiro, *Luschnath*.

144. *S. APUS* Spring Mon. ii. 75, ex parte. *S. albidula* Spring Mon. ii. 95. *Lycopodium apodum* Linn.! *L. albidulum* Sw.—Stems slender, trailing, densely matted, 1–4 in. long, angled on the face, the short distant erecto-patent branches simple or forked. Leaves of the lower plane spaced below the tip of the branches, the upper spreading, the lower reflexed, ovate, acute,  $\frac{1}{2}$  lin. long, pale green, membranous, unequal-sided, more produced on the upper side of the midrib, serrulate, not distinctly ciliated, cordate on the upper side at the base, and a little imbricated over the stem; leaves of the upper plane half as long, ovate, shortly cuspidate. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1-12th to 1-8th in. diam.; bracts ovate, acute, membranous, about a line long, strongly serrulate, acutely keeled in the upper half.

Hab. Canada, and through the United States to Texas. Common in cultivation. Interesting geographically as a representative in the temperate zone of a characteristically tropical group.

145. *S. PRASINA* Baker in Journ. Bot. 1884, 113. — Stems slender, square, trailing, intermatted, 1–2 in. long, flat on the face, with a few short spreading simple branches. Leaves of the lower plane, the upper contiguous and ascending, the lower spreading and spaced, ovate, obtuse or subacute,  $\frac{1}{3}$  lin. long, bright green, membranous, unequal-sided, more produced on the upper side of the midrib, broadly rounded on the upper side at the base, obscurely ciliated, and a little imbricated over the stem; leaves of the upper plane half as long, ovate or oblong, acute, not cuspidate. Spikes

short, copious,  $\frac{1}{2}$  lin. diam.; bracts suborbicular, cuspidate, membranous, strongly keeled in the upper half.

Hab. Eastern Cuba, *C. Wright* 1825! 1825 b!

146. *S. CONFERTA* Baker in Journ. Bot. 1884, 113.—Stems very slender, trailing, intermatted, 1–2 in. long, copiously pinnate, the lower branches slightly compound. Leaves of the lower plane close, erecto-patent, linear-oblong, obtuse,  $\frac{1}{2}$  line long, bright green, membranous, equal-sided, rounded, strongly ciliated, and a little imbricated over the stem at the base; leaves of the upper plane a third to one-fourth as long, oblique oblong, acute. Spikes very short,  $\frac{1}{2}$  lin. diam.; bracts ovate, crowded, strongly keeled.

Hab. Cuba, *Wright* 3909! A near ally of *S. albonitens*.

147. *S. ALBONITENS* Spring Mon. ii. 80. *S. mollis* L'Herminier, Fée Fil. Ant. tab. 34, fig. 1.—Stems slender, trailing, copiously pinnate, the upper branches simple, the lower slightly compound. Leaves of the lower plane spaced on the main stem, spreading, oblong-lanceolate, a line long, subacute, membranous, bright green, rather unequal-sided, rounded on the upper side at the base, shortly ciliated, and slightly imbricated over the stem; leaves of the upper plane a third as long, oblique ovate, with a distinct cusp. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, very crowded, strongly keeled.

Hab. West Indies; Cuba (*Wright* 940!); Jamaica, Guadeloupe, Porto Rico; South Brazil, *Tweedie*!

148. *S. CLADORHIZANS* A. Br. in Crypt. Nov. Gran. 366.—Stems very weak, trailing, 2–3 in. long, copiously pinnate, the upper branches simple, the lower slightly compound, excurrent and whip-like at the top, with rudimentary leaves. Leaves of the lower plane spaced below the tip of the branches, spreading, oblong, lanceolate, subacute, a line long, pale green, membranous, nearly equilateral, rounded on both sides at the base, the upper shortly ciliated, and slightly imbricated over the stem; leaves of the upper plane a third as long, obovate, distinctly cuspidate. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, under 1 lin. diam.; bracts ovate-lanceolate, crowded, strongly keeled.

Hab. Venezuela, at Tovar, *Fendler* 324! Limestone rocks at Trovadoes, on the Rio Tapajoz, *Trail* 1436! A near ally of *S. albonitens*.

149. *S. DELTOIDES* A. Br. in Crypt. Nov. Gran. 371.—Stems trailing, 2–3 in. long, copiously pinnate, the lower branches slightly compound. Leaves of the lower plane crowded and ascending towards the tip of the branches, spaced and spreading on the main stem, oblong-lanceolate, subacute, a line long, bright green, firmer in texture than in *albonitens*, rather more produced on the upper side of the midrib, not ciliated, cordate on the upper side at the base, and imbricated over the stem; leaves of the upper plane half as long, oblique ovate, acute, not cuspidate. Spikes square,  $\frac{1}{2}$ –1 in. long, 1 lin. diam.; bracts ovate-lanceolate, rigid, strongly keeled.

Hab. Inundated caatingas at Panuré, on the Rio Uapes, *Spruce* 2535! A near ally of *S. albonitens*.

150. *S. FLAGELLATA* Spring Mon. ii. 208. — Stems trailing, intermatted, half a foot long, the branches erecto-patent, the lower copiously compound, the branchlets excurrent and whip-like at the end. Leaves of the lower plane ovate-lanceolate, very acute, above a line long, pellucid, bright green, more produced on the upper side of the midrib, rounded at the base, shortly ciliated, and imbricated over the stem; leaves of the upper plane a third as long, ovate-acuminate, falcate, convergent. Spikes  $\frac{1}{3}$ – $\frac{1}{2}$  in. long; bracts very acuminate, strongly keeled.

Hab. In French Guiana, on rocks on the banks of the streams of Upper Oyapok, *Leprieur*.

151. *S. RHIZOPHORA* Baker in Journ. Bot. 1884, 244.—Stems very slender, trailing, half a foot long, closely pinnate, the erecto-patent branches copiously compound, both branches and main stem often excurrent and whip-like at the tip. Leaves of the branchlets oblong-lanceolate, contiguous and ascending, of the main stem ovate-lanceolate, spaced and nearly spreading, acute, 1-12th to 1-8th in. long, bright green, membranous, rather unequal-sided, broadly rounded, serrulate, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblique ovate, with a long cusp. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts crowded, ovate-lanceolate, strongly keeled.

Hab. In woods near the towns of San Juan and Panama, *Seemann* 29! 32!

## Series II.—ASCENDENTES.

### Group 1.—*Suberectæ*.

152. *S. YEMENSIS* Spring Mon. ii. 193. *S. adunca* A. Br. *Lycopodium yemense* Sw. Syn. Fil., tab. 4, fig. 4.—Stems 6-9 in. long, wiry, decumbent and unbranched, with root-fibres from the nodes in the lower part, decompound upwards, with dense erecto-patent flabellately compound branches. Leaves obscurely dimorphous, those of the lower plane imbricated, usually adpressed to the stem, rarely erecto-patent, oblong, cuspidate,  $\frac{1}{2}$  lin. long, rigid in texture, with a distinct white serrulate edge; those of the upper plane rather shorter and more erect. Spikes short, square,  $\frac{3}{4}$ –1 lin. diam.; bracts deltoid, with a long cusp, strongly keeled.

Hab. West Himalayas, ascending 3000 ft. in Gurwhal, and mountains of Arabia and Abyssinia. A near ally of *sanguinolenta* and *borealis*, and a connecting link between the subgenera *Euselaginella* and *Stachygynandrum*.

153. *S. BOREALIS* Spring Mon. ii. 96. *S. Jacquemontii* Spring Mon. ii. 124. *Lycopodium boreale* Kaulf. — Stems densely matted, terete, very slender, wiry, bright red, usually ascending, forked low down, reaching a length of half a foot or more, distantly pinnately branched, with short copiously compound branches. Leaves slightly dimorphous, those of the lower plane close, erecto-patent, obovate,  $\frac{1}{2}$  lin. long, cuspidate, firm in texture, convex on the back, with a distinct keel, slightly oblique; those of the upper plane erect and rather smaller. Spikes square  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts deltoid, acute, imbricated,  $\frac{1}{2}$  lin. long, angular on the back.



**Hab.** Eastern Siberia, Kamschatka, and Eastern Himalayas. Habit of *S. sanguinolenta*, from which it differs by its slightly dimorphous leaves. Rarely the stems are decumbent, with root-fibres from the upper nodes.

154. *S. NEOCALEDONICA* Baker in Journ. Bot. 1884, 245.—Stems suberect, with root-fibres from the base only, reaching a length of half a foot, distantly pinnate, the short erecto-patent branches sparingly compound. Leaves of the lower plane close on the branchlets, spaced on the main stem, erecto-patent, ovate, subacute, bright green, firm in texture, not more than  $\frac{1}{2}$  lin. long, nearly equal-sided, serrulate, rounded at the base on the upper side, and a little imbricated over the stem; leaves of the upper plane half as long, ovate, acute, not cuspidate. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, strongly keeled, scarcely longer than the sporangia.

**Hab.** New Caledonia, in damp places on the mountains of Balade, Vieillard 1690!

155. *S. MACGILLIVRAYI* Baker in Journ. Bot. 1884, 245.—Stems reaching a length of 6–9 in., suberect, with root-fibres from the base only, bisulcate on the face, scarcely at all branched in the lower third or quarter, distantly branched upwards, the branches ascending and little compound. Leaves of the lower plane contiguous on the branchlets, much spaced on the stem, nearly spreading, ovate-oblong, obtuse, flat, 1 lin. long, bright green, moderately firm in texture, nearly equal-sided, rounded and shortly ciliated, and a little imbricated over the stem at the base on the upper side; leaves of the upper plane half as long, ovate, acute. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, strongly keeled, scarcely longer than the sporangia.

**Hab.** Isles of Pines, in clefts of rock near the summit of the main peak, Macgillivray 729! Milne 208!

156. *S. BARBATA* Spring Mon. ii. 204, ex parte.—Stems suberect, half a foot long, with root-fibres from the base only, copiously pinnate, angled on the face, the close erecto-patent branches copiously compound. Leaves of the lower plane close on the branches, spaced on the stem, ovate, acute, ascending, a line long, bright green, moderately firm in texture, nearly equal-sided, broadly rounded and ciliated on both sides at the base, imbricated on the upper side over the stem; leaves of the upper plane half as long, oblique ovate, acute. Spikes short, 1 lin. diam.; bracts deltoid, with a long cusp, strongly keeled.

**Hab.** Philippines, Cuming 2014!

157. *S. SUBERECTA* Baker in Journ. Bot. 1884, 245. *S. barbata* Spring Mon. ii. 204, ex parte.—Stems suberect, 6–9 in. long, rounded on the back, acutely angled on the face, little branched in the lower third, copiously branched upwards with crowded ascending very compound branches. Leaves of the lower plane crowded and much imbricated on the branchlets, nearly contiguous on the main stem, ascending, oblique ovate, acute, 1–12th to 1–8th in. long, bright green, moderately firm in texture, more produced on the upper side of the midrib, shortly ciliated on the upper side, very cordate on the upper side at the base, and much imbricated over the stem;

leaves of the upper plane half as long, oblique ovate, cuspidate, much imbricated on the branchlets. Spikes not seen.

Hab. Malacca, *Griffith*! Upper Yangtze, China, *Francis*!

158. *S. ACUTANGULA* Spring Mon. ii. 206. — Stem erect, about half a foot long, with root-fibres confined to the base, strongly angled down the face, decomposed, closely pinnate, the ascending branches copiously pinnate. Leaves of the lower plane rather spaced both on the stem and branches, spreading, lanceolate-rhomboid, acute, bright green, moderately firm in texture, 1-12th in. long, unequal-sided, more rounded, strongly ciliated and imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, with a long cusp, conspicuously ciliated. Spikes square, copious,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate, acute, crowded, strongly keeled.

Hab. Malacca, *Griffith*!

159. *S. ERECTIFOLIA* Spring Mon. ii. 92. *S. camptostachys* Fée Fil. Bras. 225, tab. 75, fig. 3. — Stems 3-6 in. long, suberect, with root-fibres from the base only, copiously pinnate, the erecto-patent branches considerably compound. Leaves of the lower plane ascending and contiguous both on the stem and branches, oblong-lanceolate, acute, bright green, moderately firm in texture,  $\frac{1}{2}$  lin. long, nearly equal-sided, rounded, shortly ciliated and imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, cuspidate, much imbricated. Spikes square,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Rio Janeiro, *Swainson*! *Glaziov* 2242!

160. *S. PEARCEI* Baker in Journ. Bot. 1884, 246. — Stems suberect, 6-9 in. long, with root-fibres from the base only, bisulcate down the face, copiously pinnate, the erecto-patent branches considerably pinnately compound. Leaves of the lower plane spreading or rather ascending, contiguous on the branches, spaced on the main stem, ovate-lanceolate, acute,  $\frac{3}{4}$ -1 lin. long, dark green, moderately firm in texture, rather unequal-sided, rounded and shortly ciliated and imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, acute, much imbricated. Spikes short, 1 lin. diam.; bracts ovate, acute, serrulate, strongly keeled.

Hab. Cordilleras of Pozuzo, alt. 6000 ft., *Pearce*!

161. *S. SETIGERA* Jenm. in Journ. Bot. 1886, 273. — Stems suberect,  $\frac{1}{2}$ -1 ft. long, usually rooting at the base only, but sometimes also at the caudate tip, copiously compound; branchlets erecto-patent, lower compound, rhomboid. Leaves bright green, moderately firm in texture, those of the lower plane close, ascending, oblong,  $\frac{1}{3}$  in. long, with an oblique point and distinct midrib, more produced and more rounded at the base on the upper side, copiously ciliated on both sides downwards; leaves of the upper plane half as long, ascending, ovate cuspidate. Spikes short, square; bracts ovate, similar to the leaves in texture.

Hab. Jamaica, *Wilson* 136! *Morris* 503! *Sherring*!

Group 2.—*Atrovirides*.

162. *S. MICROCLADA* Baker in Journ. Bot. 1884, 246. — Stems suberect, 4–6 in. long, with root-fibres only from the lower part, flat on the back, bisulcate down the face, flabellately decompound, the leaflets of all the branchlets very much smaller than those of the stem. Leaves of the lower plane spaced even on the branchlets, spreading or ascending, oblique ovate, subacute,  $\frac{1}{8}$  in. long, pale green, moderately firm in texture, very unequal-sided, not all ciliated, broadly rounded and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, shortly cuspidate. Spikes not seen.

Hab. Chong-tong, Sikkim, alt. 4000 ft., *Dr. Anderson* 1404!

163 *S. PLUMEA* Spring Mon. ii. 136. — Stems suberect,  $\frac{1}{2}$ –1 ft. long, the root-fibres confined to the base, bisulcate on the face, flat on the back, decompound, the branching between pinnate and flabellate. Leaves of the lower plane crowded on the branchlets, rather spaced on the main stem, oblong-lanceolate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green, not very firm in texture, very cordate, shortly ciliated and much imbricated over the stem on the upper side at the base; leaves of the upper plane small, obovate, imbricated, with a cusp as long as the blade. Spikes copious  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate acuminate, strongly keeled.

Hab. Malay Peninsula, *Griffith*! *Lady Dalhousie*! *Maingay* 1832!

164. *S. TRICHOBASIS* Baker in Journ. Bot. 1884, 275. — Stems suberect,  $\frac{1}{2}$ –1 ft. long, angled on the face, flat on the back, the root-fibres confined to the base, densely decompound, the crowded ascending branches elongated and copiously pinnate, the branchlets subflabellate. Leaves of the lower plane crowded, except in the lower part of the main stem, ovate-lanceolate, acute, spreading,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green, moderately firm in texture, very unequal-sided, with a large cordate strongly ciliated auricle on the upper side at the base, which is much imbricated over the stem; leaves of the upper plane small, obovate, much imbricated, with a cusp as long as the blade. Spikes copious,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long. 1 lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. Penang, *Wallich*! (included in Herb. Ind. under No. 120); Singapore, *Sir W. Norris*! A near ally of *S. Plumea*.

165. *S. COCHLEATA* Spring Mon. ii. 121. *Lycopodium cochleatum* Hook. & Grev. — Stems suberect, tetragonous, about a foot long, decompound, the branching midway between pinnate and flabellate. Leaves of the lower plane crowded, spreading, oblong-rhomboid, obtuse,  $\frac{1}{8}$  in. long, bright green, rigid in texture, unequal-sided, dilated, broadly rounded and serrulate on the upper side at the base; leaves of the upper plane half as long, ovate, with a long cusp, much imbricated. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate, with a long cusp, strongly keeled.

Hab. Adam's Peak, Ceylon, *Moon*! I have seen only Hooker and Greville's single type-specimen, which is in the herbarium of the British Museum.



166. *S. ATROVIRIDIS* Spring Mon. ii. 124. *S. trinervia*, *intermedia*, and *Blumei* Spring Mon. ii. 125–128. *Lycopodium atroviride* Wall. Cat. No. 120; Hook. & Grev. Ic. Fil. t. 39. *L. furcatum* Roxb. *L. intermedium* Blume. — Stems suberect,  $\frac{1}{2}$ –1 ft. long, bisulcate down the face, flat on the back, the root-fibres confined to the lower part, decompound, the branching between dichotomous and pinnate. Leaves of the lower plane close both on the stem and branches, spreading or rather ascending, oblong-rhomboid, subobtuse, 1-5th to 1-4th in. long, spuriously 3-nerved, bright green, rather firm in texture, unequal-sided, broadly rounded, obscurely or distinctly ciliated and imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblong, with a long cusp, much imbricated. Spikes square,  $\frac{1}{2}$ –1 in. long, 1 lin. diam.; bracts ovate, strongly keeled.

Hab. Madras, Malay Peninsula and Islands, South China, Hong-Kong and Formosa. Well known in cultivation.

167. *S. ALOPECUROIDES* Baker in Trimen's Journ. 1881, p. 368. — Stems ascending, above a foot long, with several ascending simple or 2–3 furcate branches. Leaves of the lower plane crowded, oblique lanceolate,  $3\frac{1}{2}$ –4 lin. long, produced on the upper side at the base, with a large cordate auricle imbricated over the stem, moderately firm in texture, bright green, not ciliated; leaves of the upper plane ovate, ascending, much imbricated,  $\frac{1}{8}$  in. long, not cuspidate. Spikes square,  $\frac{1}{2}$ –1 in. long,  $\frac{1}{8}$  in. diam., 2–3-nate from the tip of the branches; bracts rigid, uniform, ovate acuminate, erecto-patent, strongly keeled.

Hab. Borneo, *Curtis* 83! The finest of the Old World Ascendentes, rivalling *articulata* in the breadth of its leafy stems.

168. *S. CUMINGIANA* Spring Mon. ii. 126. — Stems suberect, a foot or more long, flat on the back, bisulcate down the face, copiously pinnate, the ascending branches again copiously pinnately compound. Leaves of the lower plane crowded on the branches, spaced on the lower part of the main stem, spreading or rather ascending, oblong-rhomboid, obtuse, spuriously 3-nerved, bright green, moderately firm in texture, nearly equal-sided, rounded and shortly ciliated on both sides at the base, laterally attached and not imbricated on the upper side over the back of the stem; leaves of the upper plane oblique obovate, much imbricated, not at all cuspidate. Spikes square, 1–2 in. long, 1 lin. diam.; bracts ovate acuminate, strongly keeled.

Hab. Philippines, *Cuming* 2011! 2012! A plant from Borneo, *Motley* 829!, differs by having cusps to its leaves of the upper plane.

162. *S. KALBREYERI* Baker in Journ. Bot. 1884, 276. — Stems 1–1 $\frac{1}{2}$  ft. long, ascending from a decumbent base, the root-fibres confined to the base, the face angled, the few ascending pinnæ elongated, lanceolate, 2–3-pinnate, sometimes whip-like at the tip, the final branching subflabellate, the ultimate divisions  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{8}$  in. broad. Leaves of the lower plane contiguous on the final branches, spaced on the pinnæ and main stem, oblong-lanceolate, acute, ascending, falcate, 1-12th to 1-8th in. long, bright

green, moderately firm in texture, dilated, broadly rounded, strongly ciliated and imbricated over the stem on the upper side at the base; leaves of the upper plane very small, obovate, with a cusp as long as the lamina. Spikes not seen.

Hab. Cameroon Mountains, 2500 ft., *Kalbreyer* 164! A near ally of *S. monospora*.

170. *S. OLIGOCLADA* Baker in Journ. Bot. 1884, 277. — Stems ascending, a foot or more long, slender, stramineous, flat on both back and face, copiously pinnate, the erecto-patent branches sparingly pinnately compound. Leaves of the lower plane contiguous or nearly so on the branches, rather ascending, oblique ovate, acute, 1-12th to 1-8th in. long, dark green, moderately firm in texture, dilated on the upper side, serrulate, broadly rounded and much imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, ovate, with a short cusp. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Andes of Ocana, New Granada, alt. 8000—9000 ft., *Kalbreyer* 1080!

171. *S. VERNICOSA* Baker in Trans. Linn. Soc. new ser. Bot. ii. t. 56A. — Stems decumbent at the base, then ascending, 3-4 in. long; branches long, simple or compound,  $\frac{1}{8}$  in. diam. Leaves thick and firm in texture, glossy green, those of the lower plane crowded, imbricated, ascending, ovate, obtuse, 1-12th in. long, minutely ciliated; those of the lower plane more than half as long, ovate, much imbricated. Spikes very short; bracts large, ovate.

Hab. British Guiana; Mount Roraima, *Im Thurn* 381! Var. *oligoclada* Baker, tab. 56B, has only a few long simple branches.

172. *S. REGULARIS* Baker in Journ. Bot. 1884, 277. — Stems about  $\frac{1}{2}$  ft. long, suberect, with the root-fibres confined to the lower third, bisulcate down the face, regularly pinnate, the lower branches copiously compound. Leaves of the lower plane rather spaced, except at the tip of the branchlets, rather ascending, ovate- or oblong-lanceolate, acute, a line long, bright green, rather thin in texture, unequal-sided, serrulate, not distinctly ciliated, broadly rounded and a little imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblique ovate, with a short cusp. Spikes  $\frac{1}{4}$ — $\frac{1}{2}$  in. long, square,  $\frac{1}{2}$ —1 lin. diam.; bracts ovate cuspidate, crowded, strongly keeled.

Hab. In Eastern Peru, near Tarapoto, *Spruce* 3977!

173. *S. ASSURGENS* Baker in Journ. Bot. 1884, 277. — Stems suberect, decompound,  $\frac{1}{2}$  ft. long, convex on the face, flat on the back, the close ascending branches copiously compound. Leaves of the lower plane contiguous on the branchlets, spaced on the branches and main stem, ascending, oblong-lanceolate, acute, 1-12th to 1-8th in. long, bright green, moderately firm in texture, rather unequal-sided, broadly rounded, denticulate and a little imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, with a long cusp. Spikes copious, square,  $\frac{1}{4}$ — $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate, acute, strongly keeled.

Hab. South Brazil, *Gardner* 76! *Burchell* 2238! *Glaziov* 5215! 5637! 7968! Midway between *erectifolia* and *Martensii*.

174. *S. SUBCAULESCENS* Baker in Journ. Bot. 1884, 277.—Stem above  $\frac{1}{2}$  ft. long, stiffly erect, acutely angled on the face, simple near the base, closely pinnate, with erecto-patent copiously compound branches. Leaves of the lower plane contiguous and rather ascending on the branchlets, much spaced and spreading on the main stem, oblong- or ovate-lanceolate, acute, 1-12th to 1-8th in. long, bright green, moderately firm in texture, broadly rounded and shortly ciliated on the upper side at the base, and a little imbricated over the stem; leaves of the upper plane small, ovate, with a long cusp. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Eastern Cuba, *C. Wright* 1822!

175. *S. CONTIGUA* Baker in Journ. Bot. 1884, 295. — Stems  $\frac{1}{2}$  ft. long, suberect, with copious long root-fibres from the lower third, decompound, the branching between flabellate and pinnate, the face raised, the back flat. Leaves of the lower plane erecto-patent, crowded both on the stem and branches, lanceolate, pointed at the upper corner, 1-6th to 1-5th in. long, bright green, moderately firm in texture, unequal-sided, cordate and conspicuously ciliated on the upper side at the base, and so much imbricated over the stem that it is quite hidden; leaves of the upper plane ovate, with a long squarrose cusp, much imbricated. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Rio Janeiro, *Glaziov* 4493! 5638! A near ally of *Martensii* and *atroviridis*.

176. *S. RIGIDULA* Baker in Journ. Bot. 1884, 295. — Stems stout, stramineous, suberect, above a foot long, with the root-fibres confined to the base, copiously pinnate, the ascending branches copiously pinnately compound, with short regular simple or forked branchlets. Leaves of the lower plane contiguous or nearly so on the branchlets, ascending, oblique ovate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green, rather firm in texture, unequal-sided, strongly serrulate on the upper margin, broadly rounded and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, with a large cusp. Spikes copious, short, square,  $\frac{3}{4}$ –1 lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Andes of Ocaña, New Granada, alt. 5000–6000 ft., *Kalbreyer* 972! A near ally of *S. Martensii*.

177. *S. BAHIENSIS* Spring Mon. ii. 158. — Stems quadrangular, suberect, a foot long, with long copiously pinnate flexuose branches, with compound branchlets. Leaves of the lower plane ovate-oblong, subacute, subfalcate,  $\frac{1}{6}$  in. long, twice as long as broad, horizontal from an oblique base, bright green, rather rigid in texture, the margin much reflexed, the upper edge serrulate and rounded at the base; leaves of the lower plane ovate, with a long cusp. Spikes short, square; bracts ovate lanceolate, strongly keeled.

Hab. Bahia, *Blanchet*.



178. *S. CALIFORNICA* Spring Mon. ii. 98.—Stems slender, tufted, suberect, 4–6 in. long, tetragonous, copiously pinnate, with erecto-patent sparingly compound branches. Leaves of the lower plane ascending, crowded on the branchlets, ovate, obtuse,  $\frac{1}{8}$  in. long, minutely cuspidate, light green, rather rigid, twice as long as broad, unequal-sided, subcordate and denticulate on the upper side at the base, and imbricated over the stem; leaves of the upper plane very small, ovate-oblong, cuspidate. Spikes short, simple, square; bracts ovate-lanceolate, sharply keeled.

Hab. California, *Deppe*. I have not seen this.

179. *S. MARTENSII* Spring Mon. ii. 129. *S. Poppigiana* Hook, Fil. Exot, t. 56, non Spring. *Lycopodium flabellatum* Mart. & Gal., non Linn.—Stems  $\frac{1}{2}$ –1 ft. long, trailing in the lower half, with copious long root-fibres, ascending in the upper half, decompound, the branching between pinnate and flabellate, flat or terete on the back, strongly angled in the lower part on the face. Leaves of the lower plane usually crowded, erecto-patent, oblong-lanceolate, sub-obtuse, bright green, moderately firm in texture, unequal-sided, broadly rounded, serrulate, not distinctly ciliated, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblique oblong, with a long cusp, much imbricated. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, square, 1 lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Common in Mexico. This is now the commonest species in European gardens, next to *S. Kraussiana*. In Ann. Sc. Nat. series 4, vol. 13, p. 67, A. Braun fully defines its varieties. The most striking is *divaricata*, with fewer and more divaricating branchlets than in the type, and smaller and less crowded leaves.

180. *S. XIPHOPHYLLA* Baker in Journ. Bot. 1884, 296. *S. flaccida* Spruce MSS., non Spring.—Stems suberect,  $\frac{1}{2}$  ft. long, forked low down, with copious long radicles from near the base, terete on the back, decompound, with branching between pinnate and flabellate. Leaves of the lower plane close on both branches and branchlets, erecto-patent, lanceolate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, nearly equal-sided, bright green, not so firm in texture as in *Martensii*, rounded and shortly ciliated, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, with a cusp as long as the lamina. Spikes copious, square, 1 lin. diam.; bracts ovate-lanceolate, crowded, strongly keeled.

Hab. Mount Guayrapurima, Eastern Peru, *Spruce* 3990! Differs from *sulcata* by its suberect habit and continuous stems.

181. *S. BOMBYCINA* Spring Mon. ii. 191.—Stem a foot or more long, suberect, bisulcate down the face, copiously pinnate, the branches erecto-patent, the lower elongated and again regularly closely pinnate. Leaves of the lower plane contiguous, rather ascending, lanceolate, rather falcate, pointed at the upper corner,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, dark green, moderately firm in texture, unequal-sided, very cordate, strongly ciliated and much imbricated over the stem on the upper side at the base; leaves of the upper plane a third to one-fourth as long, oblique ovate, cuspidate, much imbricated.

Spikes terminal on the branchlets,  $\frac{1}{2}$ –1 in. long, square, 1 lin. diam.; bracts ovate-lanceolate, very crowded, strongly keeled.

Hab. Andes of Eastern Peru, *Matthews* 1781! *Spruce* 4628! A very fine and well-marked species.

182. *S. CHRYSOLEUCA* Spring Mon. ii. 197. *S. Sprucei* Hook. 2 Cent. Ferns, t. 83. — Stems a foot long, trailing or simple in the lower half, with long root-fibres, deltoid and ascending in the upper half, with simple or forked ascending branches. Leaves of the lower plane crowded and spreading horizontally both on the stem and branches, lanceolate, subobtuse,  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, bright green, moderately firm in texture, rather unequal-sided, serrulate, broadly rounded on the upper side at the base, and much imbricated over the stem; leaves of the upper plane half as long, ovate, with a long cusp, much imbricated. Spikes copious, lateral, square,  $\frac{1}{4}$ –1 in. long, 1-12th to 1-8th in. diam.; bracts ovate-lanceolate, crowded, strongly keeled.

Hab. Andes of Peru, *D'Orbigny*! *Spruce* 4623! *Pearce*! New Granada, *Kalbreyer* 962! A very fine and distinct species.

183. *S. RUBELLA* Moore in Gard. Chron. 1871, 902, fig. 190. — Stems a foot long, suberect, with root-fibres from the lower half, reddish brown, bisulcate on the face, pinnately branched, the lower branches cuneate, with 5–7 branchlets. Leaves of the lower plane spreading or rather ascending, crowded on the branchlets, oblique-oblong, obtuse or obscurely cuspidate, 1-12th to 1-8th in. long, moderately firm in texture, dark green, turning reddish with age, more produced on the upper side at the base, where it is ciliated and imbricated over the stem; leaves of the upper plane half as long, ovate cuspidate, much imbricated. Spikes square,  $\frac{1}{2}$ –1 in. long, 1 lin. diam.; bracts deltoid, with a long cusp, strongly keeled.

Hab. Native country unknown. Introduced into cultivation by Mr. B. L. Williams about 1870. Intermediate in general habit between *Martensii* and *concinna*.

### Group 3.—*Articulatæ*.

184. *S. EPIRHIZOS* Spring Mon. ii. 218. — Stems 1–2 ft. long, decumbent in the lower part, with long root-fibres from the nodes, forked low down, sulcate down the face, ascending in the upper part, copiously pinnate, with short erecto-patent simple or little-compound branches. Leaves of the lower plane crowded on the branches, spaced on the stem, rather ascending, oblong-lanceolate, acute, rather falcate, bright green, moderately firm in texture, 1-6th to 1-5th in. long, unequal-sided, not ciliated, broadly rounded, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblique ovate, much imbricated, not cuspidate. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate, acute, strongly keeled.

Hab. French Guiana, *Leprieur*! Dutch Guiana, *Hostmann*, *Kappler*. British Guiana, *Jenman* 645!

185. *S. GALEOTTEI* Spring Mon. ii. 220. *S. vexata* Liebm. *Lycopodium stoloniferum* and *fruticulosum* Mart. & Gal. — Stems

1–2 ft. long, suberect, with root-fibres from the lower half, sometimes excurrent and whip-like at the tip, flat on the back, bisulcate on the face, copiously pinnate, the branches pyramidal and decompound. Leaves of the lower plane close on the branchlets, spaced on the branches and stem, ascending, lanceolate or oblong-lanceolate, acute,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green and moderately firm in texture, more produced on the upper side of the midrib, laterally attached, not imbricated over the stem, broadly rounded and shortly ciliated on the upper side at the base, truncate and auricled on the lower; leaves of the upper plane a third to half as long, oblique ovate or oblong, acute, much imbricated. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam., square; bracts ovate cuspidate, strongly keeled.

Hab. Common in Mexico, *Galeotti* 6606! *Linden* 85! *Bourgeau* 1425! *Hahn* 2025! Guatemala, *Salvin & Godman* 373! Frequent in gardens. I do not think Spring's Panaman and Bolivian plants are this species, but his *S. Poeppigiana* var. *mxicana* belongs here.

186. *S. SERICEA* A. Br. in Crypt. Nov. Gran. 392. — Stems stout, suberect, a foot or more long, flat on the back, deeply bisulcate down the face, sending out long radicles from the lower nodes, copiously pinnate, the erecto-patent branches flabellately compound. Leaves of the lower plane crowded and rather ascending on the branches, spaced on the main stem, oblong-lanceolate, obtuse,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, bright green, firm in texture unequal-sided, not ciliated, auricled on both sides at the base, dilated and broadly rounded on the upper side, and much imbricated over the stem; leaves of the upper plane a third as long, oblique ovate, acute. Spikes square,  $\frac{1}{2}$ –1 in. long, 1 lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Andes of Quito, *Jameson*! *Spruce* 4716! *Sodi-ro*! Three varieties are described by *Sodi-ro* in Recens. Crypt. Vasc. Quit. p. 94.

187. *S. ANISOTIS* *Sodi-ro* Recens. Crypt. Vasc. Quit. 94.—Stems 2–3 ft. long, trailing towards the base, ascending and almost sarmentose upwards; branches flaccid, elongated, pinnate; branchlets few and short. Leaves soon fading; those of the lower plane ovate, very unequal-sided,  $\frac{1}{4}$  in. long, acute or mucronate, produced, rounded and shortly auricled on the upper side at the base, cuneately truncate on the lower, on both densely ciliated; leaves of the upper plane half as long, ovate, falcate, acuminate, densely ciliated. Spikes very short, square; bracts ovate, acute, obscurely serrulate.

Hab. Andes of Quito, alt. 4000 ft., *Sodi-ro*.

188. *S. ARTICULATA* Spring Mon. ii. 211. *Lycopodium articulatum* Kunze.—Stem 1–2 ft. long, suberect, with very long radicles from the lower nodes, flat on the back, deeply bisulcate down the face, copiously pinnate, the ascending branches copiously flabellately compound. Leaves of the lower plane crowded and more or less ascending on the branches, spaced and spreading on the main stem, oblong-rhomboid, obtuse,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, bright green, moderately firm in texture, nearly equal-sided, not ciliated, rounded and distinctly auricled on the upper side at the base, and a little



imbricated over the stem; leaves of the upper plane a third as long, oblique ovate, acute, much imbricated. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate, acute, crowded, strongly keeled.

Hab. Andes of Eastern Peru, *Poppig*! *Matthews* 1085! *Spruce* 4628! Ecuador, in the woods of Archedona, *Jameson* 714!

#### Group 4. — *Radiatæ*.

189. *S. PHILIPPINA* Spring Mon. ii. 105. *S. Cumingiana* Presl., non Spring. *Lycopodium microstachyum* Desv.? — Stems slender, erect, half a foot long, quadrangular, flat on the face, copiously pinnate, the lower branches long and copiously compound. Leaves of the lower plane spaced even on the branchlets, erecto-patent, oblong, acute, bright green, membranous,  $\frac{1}{2}$  lin. long, nearly equal-sided, all the upper margin shortly ciliated, its base rounded, and a little imbricated over the stem; leaves of the upper plane half as long, ovate, acute. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, strongly keeled.

Var. *khasiensis* Baker. — Leaves of the lower plane more numerous, closer and more spreading, narrower and more acute.

Hab. The type in the Philippine Islands, *Cuming* 1999!; the variety gathered by Griffith in the Khasia Mountains.

190. *S. FLACCIDA* Spring Enum. No. 77. *S. semicordata* Spring Mon. ii. 107 ex parte. *S. radicans* Spring Mon. ii. 261. *Lycopodium flaccidum* Bory. *L. curvatum* Dalzell. — Stems suberect,  $\frac{1}{2}$ –1 ft. long, the slender root-fibres confined to near the base, copiously pinnate, the short erecto-patent branches copiously compound. Leaves of the lower plane ascending, contiguous on the branchlets, oblong, acute, a line long, bright green membranous, nearly equal-sided, narrowed to the base, which is neither ciliated nor at all imbricated over the stem; leaves of the upper plane more than half as long, oblique oblong, with a large cusp. Spikes copious, slender,  $\frac{1}{2}$ –1 in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate, cuspidate.

Hab. Bombay Ghauts and Neilgherries, *Hohenacker* 83 a! *Perottet* 1386! *Jacquemont* 689! Pegu, *Scott*! (a form with a short cusp to the leaves of the upper plane).

191. *S. PENNATA* Spring Mon. ii. 257. *S. crassicaulis* Spring Mon. ii. 172. *Lycopodium pennatum* D. Don. *L. crassicaule* Hook & Grev. — Stems reaching a foot or more in length, erect, stout and conspicuously sulcate, copiously pinnate, the ascending branches elongated and very compound. Leaves of the lower plane contiguous on the branchlets, erecto-patent, pale green, membranous, oblong, acute, a line long, nearly equal-sided, not ciliated, not at all imbricated over the stem at the base; leaves of the upper plane half as long, oblong, acute. Spikes copious, square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Himalayas of Nepaul, *Wallich*! (mixed in Herb. Ind. under No. 123 with *S. fulcrata*). Habit of *S. chrysorrhizos*, but the bracts uniform.

192. *S. MERGUINA* Spring Mon. ii. 81. — Stems suberect, slender,

3-4 in. long, sulcate down the face, the slender root-fibres confined to its base, closely pinnate, the ascending branches simple or slightly compound. Leaves of the lower plane contiguous on the branches, rather spaced on the main stem, oblong-rhomboid with a point at the upper corner,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long, pale green, very membranous, unequal-sided, broadly rounded, not ciliated, and imbricated over the stem on the upper side at the base; leaves of the upper plane very small, broad ovate, with a cusp as long as the lamina. Spikes short, square,  $\frac{3}{4}$ -1 lin. diam.; bracts ovate, acute, strongly keeled.

Hab. In Tenasserim, at Mergui, *Griffith*! Habit of *S. tenera*, but the bracts uniform.

193. *S. POULTERI* Hort. Veitch. — Stems densely tufted, very slender, suberect, 2-3 in. long, three or four times dichotomously forked, with slender radicles from the lower half. Leaves of the lower plane distinctly spaced, spreading, suborbicular, obtuse,  $\frac{1}{2}$  lin. long, bright green, moderately thick in texture, more produced on the upper side of the midrib, broadly rounded and shortly ciliated on the upper side at the base, and a little imbricated over the stem; leaves of the upper plane nearly as long, but ovate, acute, ascending. Spikes slender,  $\frac{3}{4}$ -1 in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, lax, scarcely longer than the sporangia.

Hab. Azores, introduced into cultivation by Messrs. Veitch about 1868. Leaves resembling those of *S. delicatissima*, but habit totally different.

194. *S. ABYSSINICA* Spring Mon. ii. 99. — Stems weak, suberect, very slender, 3-4 in. long, copiously pinnate, the ascending branches sparingly or copiously compound. Leaves of the lower plane spaced even on the branchlets, the lower spreading, the upper ascending, oblong-lanceolate, acute, a line long, pale green, membranous, unequal-sided, broadly rounded, shortly ciliated, and imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, cuspidate. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, sharply keeled.

Hab. Mountains of Abyssinia, *Schimper* 1444! Clarence Peak, Fernando Po, alt. 8000 ft., *Mann* 667! Either this or *S. versicolor* is probably *Lycopodium Myosurus* of Swartz, gathered by Afzelius at Sierra Leone.

195. *S. VERSICOLOR* Spring Mon. ii. 123. — Stem slender, suberect, stoloniferous from the base, copiously pinnate, the ascending branches copiously compound. Leaves of the lower plane contiguous and ascending, spreading and spaced on the main stem, oblong or oblong-lanceolate, obtuse or subacute,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long, bright green, membranous, unequal-sided, broadly rounded, shortly ciliated, and imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, broad ovate, with a cusp as long as the lamina. Spikes square,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, membranous, strongly keeled.

Hab. Senegambia *Heudelot*. Angola, in the provinces of Pungo Andongo, and Golungo Alto, *Welwitsch* 41, 42!

196. *S. MINIMA* Spring Mon. ii. 86. *Lycopodium pusillum* Leprieur. — Stem  $\frac{1}{2}$ -1 in. long, very slender, suberect, simple or

slightly compound. Leaves of the lower plane contiguous and ascending in the upper part, spaced and spreading in the lower part of the stem, oblong, acute,  $\frac{1}{2}$  lin. long, bright green, membranous, rather unequal-sided, broadly rounded, ciliated, and imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, acute. Spikes short, 1 lin. diam.; bracts ovate, acute, similar to the leaves in texture.

Hab. French Guiana, in grassy places near Cayenne, *Leprieur*!

197. *S. DECRESCENS* Spring in Plant. Vanheurck. i. 29.—Stems suberect, very slender,  $1-1\frac{1}{2}$  in. long, simple near the base, closely pinnate above it, with contiguous copiously compound branches. Leaves of the lower plane contiguous above the base of the stem, spreading or the upper ascending, oblong-lanceolate, acute, a line long, bright green, moderately firm in texture, nearly equal-sided, ciliated and cordate, and imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, much imbricated, broad ovate, with a cusp as long as the lamina. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, crowded, strongly keeled.

Hab. Shaded rocks on the Serras of Santarem, *Spruce* 682\*! 943!

198. *S. PORELLOIDES* Spring Mon. ii. 97; Fée Fil. Ant. tab. 34, fig. 3. *Lycopodium porelloides* Lam.—Stems slender, suberect, 2-3 in. long, the branches lax, the lower copiously compound. Leaves of the lower plane contiguous and ascending on the branchlets, spreading, and spaced on the main stem, ovate or oblong, subobtuse, a line long, dark green, flaccid, cordate, and conspicuously ciliated on the upper side at the base; leaves of the upper plane a third as long, ovate-lanceolate, shortly apiculate. Stems short, 1 lin. diam.; bracts ovate-lanceolate.

Hab. St. Domingo, Guadeloupe, and Mexico.

199. *S. MOLLIS* A. Br. in Crypt. Nov. Gran. 360, non Fée.—Stems slender, suberect, 3-4 in. long, flat on the face, sulcate down the back, closely pinnate, the branches erecto-patent, the lower copiously compound. Leaves of the lower plane contiguous, ascending, ovate or ovate-lanceolate, acute,  $\frac{1}{2}$  lin. long, bright green, moderately firm in texture, nearly equal-sided, rounded on both sides at the base, strongly ciliated on the upper, and a little imbricated over the stem; leaves of the upper plane a third as long, oblique ovate, much imbricated, shortly cuspidate. Spikes short, square,  $\frac{3}{4}$  lin. diam.; bracts ovate, acute, strongly keeled.

Hab. New Granada in the forests of Ocana, alt. 4000-6000 ft., *Schlim* 1029!

200. *S. CONFUSA* Spring Mon. ii. 94. *Lycopodium ornithopodioides* Sw. Syn. Fil. 184, as regards the West Indian plant.—Stems very slender,  $\frac{1}{2}$  ft. long, bisulcate down the face, flat on the back, largely pinnate, the ascending branches simple or slightly compound. Leaves of the lower plane spaced and ascending both on the stem and branches, oblique ovate, acute,  $\frac{1}{2}$  lin. long, pale green, rather rigid in texture, more produced on the upper side of the midrib, broadly rounded and ciliated on the upper side at the



base, and imbricated over the stem; leaves of the upper plane half as long, oblique ovate, cuspidate. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, sharply square,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Mountains of Jamaica, 5000–6000 ft., *Swartz*! *Wilson* 764! *Jenman*! Will most likely prove to be a montane variety of *S. radiata*.

201. *S. RORAIMENSIS* Baker in Trans. Linn. Soc. Bot. ser. ii. t. 56 c. — Stems erect, 4–5 in. long, laxly pinnately branched; branches erecto-patent, little compound. Leaves bright green, moderately firm in texture, those of the lower plane spaced out even on the branchlets, subpatent, oblique oblong, 1–12th in. long, produced on the upper side of the midrib, rounded on both sides at the base, minutely ciliated; leaves of the upper plane oblique ovate, acute, much imbricated. Spikes slender, square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long; bracts ovate, acute, strongly keeled.

Hab. British Guiana; Mount Roraima, *Im Thurn* 122! Common in the upper part of the Macouria River, *Jenman* 2324!

202. *S. PORTORICENSIS* A. Br. Crypt. Nov. Granat. 372. — Stems ascending, 4–6 in. long, copiously branched; branches ascending, lower copiously compound. Leaves membranous, soon fading; those of the lower plane imbricated on the branchlets, ovate, unequal-sided,  $\frac{1}{3}$  in. long, much produced on the upper side, very cordate at the base, imbricated over the stem and shortly ciliated; leaves of the upper plane ascending, half as long, ovate, aristate. Spikes short; bracts ovate, strongly keeled, the lower three times as long as the sporangia.

Hab. Porto Rico, *Sintenis* 1045! Like *radiata* in habit and leaf, but much more robust.

203. *S. RADIATA* Baker in Journ. Bot. 1884, 374. *S. ciliata* A. Br. in Ann. Sc. Nat. ser. 4, xiii. 68. *S. increscentifolia* Spring Mon. ii. 106. *S. Novæ-hollandiæ* Spring Mon. ii. 209. *S. Warcewiczii* Klotzsch. *Lycopodium radiatum* Aublet! *L. Novæ-hollandiæ* Swartz. *L. ciliatum* Willd. — Stems slender, suberect,  $\frac{1}{2}$ –1 ft. long, acutely angled down the face, sometimes sending out stolons from the base, closely pinnate, the ascending branches copiously compound, not whip-like at the tip. Leaves of the lower plane continuous on the branchlets, spaced on the main stem, erecto-patent, oblique ovate, acute,  $\frac{1}{2}$ –1 lin. long, bright green, rather rigid in texture, unequal-sided, very cordate and strongly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the lower plane half as long, ovate, cuspidate. Spikes square,  $\frac{1}{4}$ –1 in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Tropical America, from Costa Rica and Guiana to Peru, ascending the Andes to 8000–9000 ft. *S. bulbifera* Baker in Gard. Chron. 1867, 950, which differs from the type by its decumbent stems sending out copious root-fibres in the lower half, many of the lower branchlets excurrent and whip-like at the tip, and bearing bulbillæ, which reproduce the plant, leaves spuriously 3-nerved and not distinctly ciliated, is most likely a form of this species produced by cultivation in a damp warm atmosphere.

## Series III.—ROSULATEÆ.

204. *S. INVOLVENS* Spring Mon. ii. 63. *S. circinalis* Presl. *Lycopodium circinale* Thunb. Fl. Jap. 341. *L. involvens* Sw. *L. pulvinatum* Hook. & Grev. — Stems very densely tufted, 2–6 in. long, deltoid, 2–3 pinnate, branched nearly or quite from the base, the branching of all grades between flabellate and pinnate. Leaves of the lower plane very crowded, ascending, ovate, with a distinct cusp, about a line long, bright green, very thick and rigid in texture, serrulate on both margins, nearly equal-sided; leaves of the upper plane nearly as long, oblique, ovate-lanceolate, with a distinct cusp. Spikes square,  $\frac{3}{4}$  lin. diam.; bracts deltoid cuspidate, acutely keeled.

Var. *S. Veitchii* Macnab Selag. 10, tab. 1, figs. 1–5. — Leaves less cuspidate and not so much imbricated, those of the lower plane more curved, those of the upper more lanceolate. Bracts ovate-lanceolate.

Hab. Japan, Corea, Amoor-land, China, the Philippine Islands, and East Himalayas. *S. texta* Hort. is a curious form with long simple stems.

205. *S. DIGITATA* Spring Mon. ii. 73.—Stems in tufts from the nodes of a thread-like rhizome,  $\frac{1}{2}$ –1 in. long, simple in the lower two-thirds, deltoid and bipinnate in the upper third, the very close divisions rolled together, the branching between pinnate and flabellate. Leaves of the lower plane much imbricated, erectopatent, oblong, obtuse,  $\frac{1}{4}$  lin. long, dull green, very rigid in texture; leaves of the upper plane nearly as long, oblique ovate, subacute. Spikes not seen.

Hab. Madagascar, at Ambongo, *Pervillé* 608!

206. *S. IMBRICATA* Spring Mon. ii. 70; Decaisne Pl. Arab. t. 7. *Lycopodium imbricatum* Forsk. *L. circinale* Desv.—Stems densely tufted, erect,  $\frac{1}{2}$ –1 ft. long, compound only in the lower third, the primary and secondary divisions pinnate, the tertiary divisions subflabellate and deltoid. Leaves of the lower plane much imbricated, ascending, ovate, obtuse or subacute, dark green,  $\frac{1}{2}$  lin. long, very thick and rigid in texture; leaves of the upper plane nearly as long, oblique ovate, acute. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, acute, strongly keeled.

Hab. Arabia, Abyssinia, and Zambesi-land.

207. *S. STAUNTONIANA* Spring Mon. ii. 71. *S. affinis* Milde Fil. Eur. 271, non A. Br. — Stems about a span long, branched in the upper half, rhomboid, decompound, the primary and secondary branching pinnate, the tertiary subflabellate. Leaves of the lower plane crowded, ascending, oblique ovate, acute,  $\frac{1}{2}$  lin. long, firm in texture, bright green, turning reddish when old; leaves of the upper plane half as long, ovate-lanceolate, shortly cuspidate. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. North China, *Sir G. Staunton*, *Bushell*! *Bretschneider* 877!

208. *S. BRYOPTERIS* Baker in Journ. Bot. 1884, 376. *S. tamarriscina* Spring. *Lycopodium bryopteris* Linn., Sp. 1567. *L. circinale*

Linn. Syst. Veg. xiii. 704, non Linn. herb. *L. tamariscinum* Desv. (Dill. Musc. tab. 66, fig. xi.)—Stems densely tufted, simple in the lower two-thirds, deltoïd and decompound in the upper third, the primary and secondary branching pinnate, the ultimate divisions midway between pinnate and flabellate. Leaves of the lower plane much imbricated, ascending, ovate cuspidate, dark green on the face, pale green on the back,  $\frac{1}{2}$  lin. long, firm and rigid in texture, obscurely serrulate; leaves of the upper plane nearly as long, oblique ovate, with a large cusp. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, cuspidate, strongly keeled.

Hab. Central and Peninsular India.

209. *S. CONVOLUTA* Spring Mon. ii. 62. *S. hygrometrica* Spring. *Lycopodium bryopteris* Aublet, non Linn. *L. convolutum* Arnott. *L. hygrometricum* Mart. *L. revolutum* Hook. & Grev.—Stems densely tufted, 3–6 in. long, compound nearly to the base, the primary branching pinnate, the short broad erecto-patent pinnæ between pinnate and flabellate. Leaves of the lower plane much imbricated, ascending, ovate, acute,  $\frac{1}{3}$  lin. long, serrulate, bright green, firm and rigid in texture; leaves of the upper plane half as long, oblique ovate, acute. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Tropical America from Mexico to South Brazil. This is the plant that represents *Lycopodium circinale* in the herbarium of Linnæus; but the plant of the younger Linnæus in Smith's collection is an example of *S. involvens*, gathered in Japan by Thunberg.

209.\* *S. PRINGLEI* Baker. —Stems densely rosulate, hygrometric, the outer 3–4 in. long, the inner gradually shorter, flabellately branched; branchlets close, ascending, 1–12th to 1–8th in. diam. Leaves firm in texture, bright green; those of the lower plane crowded, erecto-patent, oblong,  $\frac{1}{8}$  in. long, including the conspicuous horny white awn, which is half as long as the blade; those of the upper plane but little smaller, ascending, slightly oblique. Spikes short; bracts uniform.

Hab. Mexico; near Chihuahua, *Pringle* 271!

210. *S. PILIFERA* A. Br. in Ind. Sem. Hort. Berol. 1857, App. 20.—Stems densely tufted, 3–4 in. long, copiously compound, cuneate, the branching of all grades midway between pinnate and flabellate, and the branches erecto-patent. Leaves of the lower plane crowded on the branches, rather spaced on the main stem, ascending, oblique ovate,  $\frac{1}{2}$  lin. long, distinctly cuspidate, pale green, rigid in texture, serrulate, dilated and ciliated on the upper side at the base; leaves of the upper plane half as long, oblique lanceolate, similarly cuspidate. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. Texas, *Wright*! Plateau of Central Mexico, alt. 6000–8000 ft., *Parry & Palmer* 1008! A rare species in cultivation.

211. *S. LEPIDOPHYLLA* Spring Mon. ii. 72. *Lycopodium lepidophyllum* Hook. Ic. t. 162–163.—Stems densely tufted, 2–4 in. long, branched down to the base, the primary branching closely pinnate, the broad cuneate ascending pinnæ copiously subflabellately com-



pound. Leaves of the lower plane much imbricated, ascending, oblique ovate, obtuse,  $\frac{1}{2}$  lin. long, thick and rigid in texture, minutely ciliated, green on the face, paler on the back, and when old tinted red-brown; leaves of the upper plane nearly as long, oblique ovate, obtuse. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts deltoid, acutely keeled.

Hab. Tropical America from Texas and Mexico to Peru, in exposed places.

212. *S. ORBIGNIANA* Spring Mon. ii. 68. — Stems tufted, 4–5 in. long, pyramidal, the primary branching pinnate, the branches erecto-patent, with very short branchlets. Leaves of the lower plane crowded, ovate, subfalcate, cuspidate, above a line long, rigid, in texture, dark green above, pale and shining beneath, the upper margin membranous and unequally serrulate, the lower not white-edged, but shortly rigidly ciliated; leaves of the upper plane half as long, ovate acuminate, aristate. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, sharply square; bracts ovate acuminate, acutely keeled.

Hab. Andes of Bolivia, *D'Orbigny*. Intermediate between *cuspidata* and *imbricata*.

213. *S. CUSPIDATA* Link. Fil. Hort. Berol. 158. *S. incana* Spring Mon. ii. 157. *S. densifolia*, *pallescens*, and *reticulata* Klotzsch. *Lycopodium cuspidatum* Link. *L. pallescens* Presl. — Stems densely tufted, about half a foot long, branched nearly or quite from the base, the primary branching pinnate, the short rhomboid pinnæ copiously compound with contiguous branchlets. Leaves of the lower plane crowded, ascending, oblique ovate, cuspidate, dilated and ciliated on the upper side at the base,  $\frac{1}{2}$ –1 lin. long, pale green, white-edged, rigid in texture; leaves of the upper plane nearly as long, oblique ovate, cuspidate. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{3}{4}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Var. *elongata* Spring Mon. ii. 67. *S. sulcangula* Spring Mon. ii. 163. *Lycopodium cordifolium* Hort. — Stems reaching a foot or more in length, simple in the lower part, the primary branches more elongated and more pinnate.

Hab. Cuba, Mexico, Guatemala, Venezuela, and New Granada. *S. incana* Spring differs from the type by its less crowded, less distinctly cuspidate leaves. A common species in cultivation, both the type and var. *crispa* Hort. *S. Emiliana* Hort. is a form of this species.

#### Series IV.—SARMENTOSÆ.

214. *S. PICTA* A. Br. *Lycopodium pictum* Griff. — Stems flexuose, sarmentose, suberect, 1–2 ft. long, regularly bipinnate; pinnæ oblong-lanceolate, caudate, ascending,  $\frac{1}{2}$  ft. long, the erecto-patent contiguous branchlets always simple, 1–2 in. long. Leaves of the lower plane crowded, oblong-lanceolate, falcate, pointed at the upper corner, bright green, moderately firm in texture 1–5th to 1–4th in. long, obscurely petioled, not ciliated, cuneate on the upper, rounded on the lower side at the base, not at all imbricated over the stem; leaves of the upper plane a third as long, oblique oblong, minutely cuspidate, white in the upper half. Spikes square, terminal on the branchlets,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{3}{4}$  lin. diam.; bracts ovate cuspidate, acutely keeled.

Hab. Mishme and Patkaye Hills, East Himalayas, *Griffith*!

215. *S. WALLICHII* Spring Mon. ii. 143. *S. stipulata* Spring Mon. ii. 144. *S. Gaudichaudiana* Spring Mon. ii. 149. *S. cyatheoides*, *canaliculata*, and *amboinensis* Spring. *S. velutina* Cesati. *Lycopodium Wallichii* Hook & Grev. *L. mimosoides* Roxb. *L. elegans* Wall. *L. stipulatum* Blume.—Stems sarmentose, suberect, 2–3 ft. long; pinnae lanceolate, 6–9 in. long, the invariably simple crowded erecto-patent pinnules 1–1½ in. long, the end one sometimes 3–4 in. Leaves of the lower plane crowded, oblong-lanceolate, slightly falcate, pointed at the upper corner, equal-sided, the lower ones of the pinnules 1–8th to 1–12th in. long, the upper growing gradually smaller, dark bright green, firm in texture, obscurely petiolulate, not ciliated, truncate or slightly cordate on both sides at the base, not at all imbricated over the stem; leaves of the upper plane one-fourth as long, oblique oblong, shortly cuspidate, much imbricated. Spikes square, terminal on the pinnules, ½–1 in. long, 1 lin. diam.; bracts ovate, cuspidate, strongly keeled.

Hab. East Himalayas, Malay Peninsula, Philippines, Malay Islands, and New Guinea. Common in cultivation, and one of the most ornamental of all the garden species.

216. *S. GRACILIS* Moore in Gard. Chron. 1886, i. 752.—Stem suberect, subasperous, 2–3 ft. long, copiously pinnately branched; pinnae lanceolate, 4–5 in. long; branchlets erecto-patent, simple, the lower an inch long. Leaves green on both sides, moderately firm in texture; those of the lower plane ovate-falcate, not so close as in *S. Wallichii*, produced on the upper side of the midrib and rounded at the base, adnate to the stem on the lower side; leaves of the upper plane ovate-lanceolate, slightly incurved, cuspidate. Spikes slender, square, ½–1 in. long; bracts crowded, ovate cuspidate, distinctly keeled.

Hab. Polynesia. Introduced lately into cultivation by Messrs. Veitch.

217. *S. LOBBII* Moore. *S. cognata* Hort.—Stems suberect, sarmentose, reaching a length of 3–4 ft.; pinnae regular, lanceolate-deltoid, about half a foot long, cuneate at the base, the pinnules contiguous, erecto-patent, the upper ones simple, the lower forked. Leaves of the lower plane contiguous, oblong-lanceolate, falcate, acute, ⅓ in. long on the pinnules, 1–6th to 1–5th in. on the pinnae, bright green, moderately firm in texture, truncate and rather dilated on both sides at the base, not imbricated over the stem; leaves of the upper plane a third as long, oblique ovate, cuspidate. Spikes square, terminal on the branchlets, ¼–¾ in. long, ¾ lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Borneo, *Lobb*! West Sumatra, *Beccari* 578! Rare in cultivation.

218. *S. VICTORIÆ* Moore in Gard. Chron. 1879, 74. *S. atroviridis* Bracken., non Spring.—Stems suberect, sarmentose, 3–4 ft. long; pinnae lanceolate-deltoid, usually 6–9 in. long, caudate, the upper pinnules erecto-patent and simple, contiguous, the lower forked or slightly pinnate. Leaves of the lower plane crowded, oblong-lanceolate, falcate, acute, 1–12th in. long, dark bright green, firm in texture, equal-sided, obscurely petioled, truncate on both sides at the base, not ciliated, not imbricated over the stem; leaves

of the upper plane one-fourth as long, oblique oblong, shortly cuspidate, much imbricated. Spikes square, 1-2 in. long,  $\frac{3}{4}$ -1 lin. diam.; bracts ovate cuspidate, acutely keeled.

Hab. Borneo, *Low!* Gillolo, *C. Smith!* San Cristoval, *J. G. Veitch!* Fiji, *Brackenridge!* *Daemel* 186! *Milne* 201! Intermediate between *Wallichii* and *canaliculata*, but nearer the former. Rare in cultivation.

219. *S. MEGASTACHYA* Baker in Journ. Bot. 1885, 20.—Stems suberect, sarmentose, 2-3 ft. long; pinnæ ascending, oblong-lanceolate, caudate, 6-9 in. long, the distant ascending pinnules with a few distant ascending tertiary branchlets. Leaves of the lower plane nearly contiguous on the branchlets, oblong-lanceolate, very falcate, acute, 1-12th to 1-8th in. long, bright, green, moderately firm in texture, equal-sided, not ciliated, truncate on both sides at the base, not at all imbricated over the stem; leaves of the upper plane one-fourth as long, oblique oblong, acute, not cuspidate. Spikes  $\frac{1}{2}$ -1 in. long, square, 1-12th to 1-8th in. diam.; bracts ovate cuspidate, stramineous,  $\frac{1}{8}$  in. long, acutely keeled.

Hab. New Caledonia, in damp woods at Balade and Wagap, *Vieillard!* A near ally of *S. Victoriae*.

220. *S. INÆQUALIFOLIA* Spring Mon. ii. 148. *Lycopodium inæqualifolium* Hook. & Grev. — Stems suberect, sarmentose, reaching a length of 3-4 ft.; pinnæ oblong-lanceolate, about  $\frac{1}{2}$  ft. long, the erecto-patent branchlets considerably compound with ascending contiguous tertiary divisions. Leaves of the lower plane contiguous, oblong-rhomboid, subacute, those of the branches  $\frac{1}{8}$  in., of the branchlets 1-12th to 1-8th in. long, bright green, moderately firm in texture, not ciliated, dilated and rounded on the upper side at the base, not at all imbricated over the stem; leaves of the upper plane half as long, oblique ovate-lanceolate, shortly cuspidate. Spikes square,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long,  $\frac{3}{4}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Var. *S. perelegans* Moore. *S. bellula* Moore in Gard. Chron. 1879, 173, fig. 25, non Cesati. — Stems dwarfy, not more than a foot long; pinnæ shorter, more deltoid, with more compound lower branches. Spikes copious, often an inch long.

Hab. East Himalayas and mountains of Birma and Peninsular India. Spring's Javan plant must, I think, be referred to *S. canaliculata*. A frequent species in cultivation, but scarcely more than a variety of *S. canaliculata* in a broad sense.

221. *S. CANALICULATA* Baker in Journ. Bot. 1885, 21. *S. caudata* Spring Mon. ii. 139. *S. Pouzoliana* Spring Mon. ii. 142. *S. Durvillei* A. Br.; Kuhn. Fil. Nov. Hebrid. 17. *S. conferta* Moore. *S. muricata* Cesati. *S. sinensis* Hort. *Lycopodium canaliculatum* Linn. (Dill. Musc. tab. 65, fig. 6). *L. Durvillei* Bory Voy. Coquille Crypt. t. 25. *L. caudatum*, *planum*, and *nemorum* Desv. — Stems suberect, sarmentose, reaching a length of 3-4 ft.; pinnæ deltoid, usually 4-6 in. long, sometimes flexuose and more elongated; lower branchlets copiously compound, the tertiary divisions more erecto-patent and not so close as *inæqualifolia*. Leaves of the lower plane crowded, oblong-rhomboid, pointed at the upper corner, 1-12th to 1-8th in. long on the branchlets, bright green, moderately



firm in texture, not ciliated, cuneate-truncate on the upper, nearly square on the lower side at the base, not at all imbricated over the stem; leaves of the upper plane ovate-lanceolate, acute, half as long. Spikes square,  $\frac{1}{4}$ –1 in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. East Himalayas, Birma, South China, Philippines, Malay and Polynesian Islands. Rare in cultivation.

222. *S. ANEITENSE* Baker in Journ. Bot. 1885, 21. — Suberect, with the habit of *S. canaliculata*, but much dwarfer; pinnæ patent, deltoid, 2–3 in. long and broad, cuneate at the base, the lower pinnules with slightly compound tertiary segments, the divisions of all grades erecto-patent. Leaves of the lower plane spaced even on the branchlets, ascending, ovate-lanceolate, acute, a line long on the main branches, much smaller on the ultimate segments, bright green, firm in texture, not ciliated, dilated and rounded on the upper side at the base, not imbricated over the stem; leaves of the upper plane nearly as long, oblique lanceolate, acute, not cuspidate. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Aneitum, Dr. Turnbull! A very distinct plant, most like *S. canaliculata* on a smaller scale.

223. *S. HOOKERI* Baker in Journ. Bot. 1885, 21.—Habit of *S. inæqualifolia* and *canaliculata*; pinnæ deltoid,  $\frac{1}{2}$ –1 ft. long, each with several regularly pinnate, lanceolate acuminate pinnules, with as many as 20 erecto-patent contiguous simple tertiary segments, the longest reaching an inch in length on each side. Leaves of the lower plane crowded, rather ascending, oblong-lanceolate, subacute, bright green, moderately firm in texture, 1–12th to 1–8th in. long, obscurely petioled, rounded on both sides at the base, more so on the lower, not ciliated, not imbricated over the stem; leaves of the upper plane very small, obtuse, with a distinct cusp. Spikes square, terminal on the tertiary divisions,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Khasia Mountains, Hook. fil. & Thomson!

224. *S. VIRIDANGULA* Spring in Plant. Herb. Vanheurck. i. 29. —Stems suberect, sarmentose, 3–4 ft. long; pinnæ deltoid, reaching a foot in length, erecto-patent, the pinnules with simple upper and compound lower erecto-patent tertiary divisions, the ultimate segments usually  $\frac{1}{2}$ –1 in. long, the branches bright green at the base. Leaves of the lower plane contiguous or nearly so on the branchlets, lanceolate, falcate, acute, 1–8th to 1–5th in. long ( $\frac{1}{4}$  in. long and much spaced on the pinnæ), bright green, moderately firm in texture, not ciliated, truncate at the base, dilated, especially on the lower side, not at all imbricated over the stem; leaves of the upper plane very small, oblong, with a distinct cusp. Spikes square, 1–2 in. long, 1 lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. Mountain forests of Fiji, Seemann 707 bis! Daemel 187! Milne 196! 545!

225. *S. CHILENSIS* Spring Mon. ii. 141. *Lycopodium chilense* Willd.—Stems sarmentose, suberect, 2–3 ft. long; pinnæ lanceolate

or lanceolate-deltoid, 3-6 in. long, the lower pinnules with 8-10 tertiary branchlets. Leaves of the lower plane contiguous, oblong-lanceolate, acute, equal-sided, not ciliated, auricled on the upper side at the base, cut away on the lower side; leaves of the upper plane a third as long, oblong-lanceolate, very falcate. Spikes square,  $\frac{1}{2}$  in. long; bracts ovate cuspidate.

Hab. Mexico, Peru, and Chili. May be conspecific with *S. canaliculata*.

#### Series V.—SCANDENTES.

226. *S. SCANDENS* Spring Mon. ii. 192. *Lycopodium scandens* Swartz; Kunze Farrn. t. 10. *Stachygynandrum scandens* P. Beauv. Fl. Owar. t. 7. — Stems slender, pale straw-coloured, polished, climbing indefinitely; penultimate divisions lanceolate, with a flexuose axis, and spreading or ascending parallel spaced simple ultimate divisions  $\frac{1}{2}$ -1 in. long. Leaves of the lower plane contiguous on the ultimate branchlets, spreading, lanceolate, acute,  $\frac{1}{8}$  in. long, blue-green, rather thin in texture, slightly dilated on the upper side at the base, hardly at all imbricated over the stem; leaves of the upper plane very small, oblong-lanceolate, cuspidate. Spikes square,  $\frac{1}{2}$ -1 in. long; bracts ovate-lanceolate, strongly keeled.

Hab. West Tropical Africa, from Senegambia southward along the coast to the Equator.

227. *S. WILDENOVII* Baker in Gard. Chron. 1867, 950. *S. lævigata* Spring Mon. ii. 137. *Lycopodium lævigatum* Willd., non Lam. *L. Wildenovii* Desv.; Hook. & Grev. Ic. Fil. t. 57. *L. pellucidum* Desv. *L. bicolor* and *cæsius-arboreum* Hort.—Stems climbing to a length of 12-20 ft. or more; pinnæ spreading, deltoid, reaching a length of 1-2 ft., the pinnules deltoid and decompose, the ultimate branchlets short and contiguous. Leaves of the lower plane crowded, ascending, ovate or oblong, 1-12th to 1-8th in. long, green with a tint of blue, moderately firm in texture, not ciliated, obscurely petioled, cordate on both sides at the base, not imbricated over the stem; leaves of the upper plane a third as long, oblique oblong, acute, not cuspidate. Spikes square,  $\frac{1}{2}$ -1 in. long,  $\frac{3}{4}$  lin. diam.; bracts suborbicular, with a short cusp, scarcely larger than the sporangia.

Hab. East Himalayas, Philippines, Cochin China, Malay Peninsula and Isles. Well known in cultivation. I have not seen the Brazilian plant referred here by Spring; his African locality refers to *S. scandens*.

228. *S. EXALTATA* Spring Mon. ii. 145. *Lycopodium exaltatum* Kunze.—Stems climbing to a length of 50-60 ft.; pinnæ deltoid, reaching a length of 3-4 ft.; pinnules lanceolate, with numerous erecto-patent simple parallel tertiary branchlets seldom above an inch long. Leaves of the lower plane contiguous, oblong-lanceolate, falcate, acute, 1-12th to 1-8th in. long, bright green, moderately firm in texture, nearly equal-sided, not ciliated, nearly truncate at the base, not imbricated over the stem; leaves of the upper plane very small, oblique oblong, shortly cuspidate. Spikes square,

$\frac{1}{2}$ –1 in. long,  $\frac{3}{4}$  lin. diam.; bracts broad ovate, little longer than the sporangia, strongly keeled.

Hab. Forests of Tropical America from Panama to Peru.

## Series VI.—CAULESCENTES.

### Group 1.—*Flabellatæ*.

229. *S. USTA* Vieill.; Baker in Journ. Bot. 1885, 29.—Stems 9–12 in. long, erect, simple at the base, compound in the upper three-quarters, the branches erecto-patent, the lower simple or little compound, the upper short, rhomboid, copiously compound. Leaves of the lower plane crowded, erecto-patent, ovate or oblong, subacute,  $\frac{1}{2}$  lin. long, bright green, rigid, dilated, cordate, serrulate, and imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblique oblong, acute, much imbricated. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, acutely keeled.

Hab. New Caledonia, on mountains near Wagap, Vieillard! Pancher!

230. *S. ARBUSCULA* Spring Mon. ii. 283. *Lycopodium Arbuscula* Kaulf.—Stems 4–6 in. long, erect, simple in the lower third or half, decompound upwards, with deltoid crowded ascending branches, the ultimate branching midway between pinnate and flabellate. Leaves of the lower plane crowded, ascending, ovate-rhomboid, subacute,  $\frac{1}{2}$  lin. long, bright green, firm in texture, rather produced, broadly rounded, denticulate, and imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblique ovate, acute, much imbricated. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, sharply keeled.

Hab. Mountains of the Sandwich Islands, 1000–5000 ft.

231. *S. MUELLERI* Baker in Journ. Bot. 1885, 122.—Stem erect, 6–8 in. long, simple in the lower half or third, decompound upwards; pinnae crowded, deltoid; final branches close, erecto-patent,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam. Leaves of the lower plane ovate-lanceolate,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. long, ascending, rather imbricated on the branchlets, bright green, moderately firm in texture; base rounded on both sides; midrib central; margin white, denticulate, not anywhere distinctly ciliated. Leaves of the upper plane oblique ovate cuspidate, about half as long, much imbricated. Spikes short; bracts ovate cuspidate, bright green, as long as the leaves of the lower plane.

Hab. New Guinea, Armit! Edelfeldt!

232. *S. CAULESCENS* Spring Mon. ii. 158. *S. peltata* Presl. *S. bellula* and *minutifolia* Cesati. *Lycopodium caulescens* Wall. *L. fruticosum* Blume, non Bory. *S. amena* Hort.—Stem generally  $\frac{1}{2}$ –1 ft. long, stiffly erect, unbranched in the lower half, with spaced adpressed leaves, deltoid and decompound in the upper half; pinnae close, deltoid, with copiously subflabellately compound lower pinnales, with contiguous ascending final branchlets  $\frac{1}{4}$ –1 in. long,  $\frac{1}{8}$  in. broad, liable to curl up in drought. Leaves of the lower plane crowded, ovate, falcate, acute,  $\frac{1}{2}$ –1 lin. long, bright green,



firm in texture, rather unequal-sided, broadly rounded and shortly ciliated on the upper side at the base, and slightly imbricated over the stem; leaves of the upper plane a third to one-fourth as long, oblique ovate, cuspidate, much imbricated. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{4}$  lin. diam.; bracts ovate cuspidate.

Var. *S. japonica* Macnab in Trans. Bot. Soc. Edinb. ix. 8.—Pinnæ less crowded, and not so decompound. Leaves of the lower plane broad ovate, those of the main stem and pinnæ nearly as broad as long, those of the unbranched part of the stem rather spreading.

Var. *S. argentea* Spring Mon. ii. 154. *Lycopodium argenteum* Wall.—Larger and more compound, the banded portion often a foot long. Leaves of the lower plane thinner in texture, ovate-lanceolate, bright green on the upper surface, whitish green beneath.

Var. *brachypoda* Baker. — Unbranched portion of the stem very short; pinnæ less compound than in the type; leaves rather larger.

Hab. The type, Japan, China, East Indies (ascending to 6000 ft. in Knaon), Ceylon, Malay Peninsula and Isles, Philippines, and New Guinea. Var. *japonica*, Japan. Var. *argentea*, Malay Peninsula. Var. *brachypoda*, Java.

223. *S. WHITMEEI* Baker in Journ. Bot. 1885, 24. — Stems stiffly erect,  $\frac{1}{2}$ –1 ft. long, decompound and oblong or deltoid in the upper half, the erecto-patent pinnæ with spaced erecto-patent simple and compound lower pinnules, the ultimate branchlets 1–1 $\frac{1}{2}$  in. long,  $\frac{1}{6}$  in. diam. Leaves of the lower plane crowded, ascending, broad ovate, acute,  $\frac{1}{2}$ –1 lin. long, bright green, rigid in texture, very unequal-sided, dilated, broadly rounded and much imbricated over the stem on the upper side at the base, not ciliated; leaves of the upper plane half to a third as long, oblique oblong, acute, much imbricated. Spikes short, square,  $\frac{3}{4}$  lin. diam.; bracts ovate-lanceolate, strongly keeled.

Mountains of Samoa, *Whitnee* 177! 221!

224. *S. PENNULA* Spring Mon. ii. 160. *S. quadrangula* Presl. *S. Presliana* Spring. *Lycopodium Pennula* Desv. — Stems stiffly erect, 1–2 ft. long, simple in the lower half, deltoid and decompound in the upper half, the lower pinnæ deltoid, 3–4-pinnate, reaching a length of half a foot, the contiguous final branchlets not more than  $\frac{1}{4}$ – $\frac{1}{3}$  in. long,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. broad. Leaves of the lower plane crowded, erecto-patent, oblong-lanceolate, acute, of the branchlets  $\frac{1}{2}$  lin. long, of the pinnæ 1 lin., dark green, moderately firm in texture, nearly equal-sided, rounded, obscurely ciliated and a little imbricated over the stem on the upper side at the base, but not entirely hiding it; leaves of the upper plane a third as long, oblique oblong, acute, much imbricated. Spikes short, copious, square,  $\frac{1}{2}$  lin. diam.; bracts ovate, cuspidate.

Hab. Philippines, *Cuming* 2000! and, according to Spring, gathered in the Neilgherries by Perrottet. Midway between *caulescens* and *flabellata* in general habit, but more compound than either of them.

225. *S. PTERYPHYLLOS* Spring Mon. ii. 162. *S. myosuroides* Presl. — Stem erect, about a foot long, simple in the lower half,

deltoid and decompound in the upper half, the lower pinnæ deltoid, the ultimate branchlets not more than  $\frac{1}{3}$  in. long,  $\frac{1}{2}$  lin. diam. Leaves of the lower plane oblong-lanceolate, erecto-patent,  $\frac{1}{2}$ -1 lin. long, acute, contiguous only on the ultimate branchlets, dark green, moderately firm in texture, narrowed from the middle to the base, nearly equal-sided, hardly at all imbricated over the back of the stem; leaves of the upper plane a third as long, oblong, shortly cuspidate. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. Philippines, *Cuming* 2017! Perhaps not more than a variety of *S. Pennula*.

236. *S. BRAUNII* Baker in Gard. Chron. 1867, 1120. *S. pubescens* A. Br., non Spring.—Stems 1-1 $\frac{1}{2}$  ft. long, erect, pale stramineous, simple in the lower half, decompound, deltoid and flexuose in the upper half, the pinnæ erecto-patent and deltoid, the pinnules regular, short, deltoid, spaced, the ultimate branchlets not more than  $\frac{1}{8}$ - $\frac{1}{4}$  in. long, 1 line broad. Leaves of the lower plane contiguous only on the final branchlets, nearly spreading, ovate-rhomboid, subobtuse,  $\frac{1}{2}$  lin. long, liable to be revolute at both edges, dark green, moderately firm in texture, narrowed to a truncate base, not imbricated over the back of the pubescent branches; leaves of the upper plane a third to half as long, oblique oblong, shortly cuspidate. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts suborbicular, cuspidate, little longer than the sporangia.

Hab. West China, *Blakiston*! A distinctly marked species, well known in cultivation.

237. *S. GRIFFITHII* Spring Mon. ii. 151. *S. virescens* Spring. *S. brevipes* A. Br. — Stems erect,  $\frac{1}{2}$ -1 ft. long, simple in the lower part, deltoid and decompound upwards, the root-fibres sometimes extending upwards to where the branching begins, the face bisulcate, the lower pinnæ deltoid, 3-pinnate, the branching of all grades pinnate, the ascending contiguous final branchlets  $\frac{1}{4}$ - $\frac{1}{2}$  in. long,  $\frac{1}{8}$  in. broad. Leaves of the lower plane contiguous, more or less ascending, oblong-rhomboid, subacute,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long, thinner in texture than in *flabellata*, spuriously 3-nerved, dilated, rounded, serrulate, and imbricated over the stem on the upper side at the base; leaves of the upper plane minute, obovate, with a large cusp. Spikes square,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate cuspidate, strongly keeled.

Hab. Mountains of Mergui, *Griffith*!

238. *S. PENTAGONA* Spring Mon. ii. 150. *S. implexa* Scott.—Stems 1-1 $\frac{1}{2}$  ft. long, ascending from a decumbent base, sometimes lengthened out and taking root at the tip, simple in lower half or third, deltoid and decompound upwards, with 2-3-pinnate deltoid lower pinnæ, the contiguous ascending final branchlets  $\frac{1}{4}$ -1 in. long,  $\frac{1}{8}$ - $\frac{1}{6}$  in. broad. Leaves of the lower plane contiguous, ascending, oblique ovate, acute, 1-12th to 1-8th in. long, bright green, moderately firm in texture, dilated, obscurely ciliated, broadly rounded, and much imbricated over the stem on the upper side at the base; leaves of the upper plane a third to one-fourth as long,

oblong-lanceolate, acute. Spikes square, short,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. Eastern Himalayas, and Parasnath. Intermediate in habit between *flabellata* and *monospora*.

239. *S. MENZIESII* Spring Mon. ii. 185. *S. Springii* Spring Mon. ii. 184. *Lycopodium Menziesii* Hook. & Grev. *L. Arbuscula* Hook. & Grev. Ic. t. 200, non Kaulf. — Stems erect,  $\frac{1}{2}$ –1 ft. long, simple in the lower half, with the leaves of the upper part spreading, deltoid and decompound in the upper half, the lower pinnae copiously compound, the final branchlets  $\frac{1}{4}$ – $\frac{3}{4}$  in. long,  $\frac{1}{8}$  in. broad. Leaves of the lower plane contiguous, oblique ovate, acute, ascending, falcate, 1-12th to 1-6th in. long, bright green, moderately firm in texture, dilated, broadly rounded, obscurely ciliated, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblique ovate, with a large cusp. Spikes short, square,  $\frac{3}{4}$  lin. diam.; bracts ovate-cuspidate, acutely keeled.

Hab. Polynesia, especially in the Sandwich Islands. I find it difficult to draw the line between this species and *S. Arbuscula* on the one hand, and *S. flabellata* on the other.

240. *S. BREYNIODES* Baker in Journ. Bot. 1885, 45. — Stems above a foot long, erect, simple in lower part, with spreading leaves, deltoid and decompound in the upper three-quarters, the branches erecto-patent and sparingly subflabellately compound, the lower ones half a foot long, the final branchlets 1-2 in. long,  $\frac{1}{4}$ – $\frac{1}{2}$  in. broad. Leaves of the lower plane contiguous even on the main stem, spreading, oblong-rhomboid, obtuse, bright green, moderately firm in texture,  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, obliquely inserted, broadly rounded, not ciliated, slightly imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblique ovate, with a large cusp, much imbricated. Spikes short, terminal, 1 lin. diam.; bracts ovate-lanceolate, acutely keeled.

Hab. Mountains of Naviti Levu, Fiji, Milne 198! 334! Leaves of both planes in size, shape and insertion closely resembling those of *S. Breynii*, but general habit of course very different.

241. *S. OBESA* Baker in Journ. Bot. 1885, 46. — Stems erect, stramineous, under a foot long, the lower third simple, the upper two-thirds deltoid, frond-like, decompound, the close primary pinnae lanceolate, copiously pinnate, with short sparingly compound ascending branchlets, the ultimate divisions  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{8}$  in. broad. Leaves of the lower plane contiguous and patent on the branches, ascending on the branchlets, oblique ovate, 1-12th to 1-8th in. long, very broad at the base, much dilated on the upper side, where it is broadly rounded, obscurely ciliated and much imbricated over the stem, the margins above the dilated base revolute; leaves of the upper plane half as long, ovate-lanceolate, with a distinct cusp. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. North Borneo, Burbidge!

242. *S. FULCRATA* Spring Mon. ii. 171. *S. pubescens* Spring



Mon. ii. 173. *Lycopodium fulcratum* Hamilt. *L. pubescens* Wall.—Stems  $1\frac{1}{2}$ –2 ft. long, stiffly erect, simple in the lower half, with a few distant small adpressed leaves, deltoid and decompound in the upper half, the pinnæ deltoid, the lower ones 3–4-pinnate, the rachises pubescent, the final branchlets contiguous,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1–12th to 1–8th in. diam. Leaves of the lower plane rather spaced even on the branchlets, ascending, lanceolate, acute, 1–12th to 1–8th in. long, bright green, liable to be revolute at both margins, nearly equal-sided, truncate, and not at all imbricated over the stem at the base; leaves of the upper plane half as long, lanceolate, incurved, not cuspidate. Spikes square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts orbicular, with a small cusp, little longer than the sporangia, incurved, not cuspidate.

Hab. East Himalayas and mountains of Birma. A well-marked species, allied only to the African *S. Vogelii*.

243. *S. GRANDIS* Moore in Gard. Chron. 1882, vol. ii. p. 40, t. 8. *S. platyphylla* Hort. Veitch.—Stems erect,  $1\frac{1}{2}$ –2 ft. long, simple in the lower half, deltoid and decompound in the upper half, the branching midway between flabellate and pinnate, the contiguous final branchlets  $\frac{2}{3}$  in. broad. Leaves of the lower plane crowded, lanceolate, very acute,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, bright green, moderately firm in texture, equilateral except at the base, where they are more rounded on the anterior side, slightly ciliated on both margins; leaves of the upper plane a third as long, obtuse, ovate-lanceolate, very acute, ascending, much imbricated. Spikes copious, square, tetragonal, 1–1 $\frac{1}{2}$  in. long, 1–12th to 1–8th in. diam.; bracts ovate-lanceolate, strongly ciliated.

Hab. Borneo, *Curtis*! A very fine plant, recently introduced into cultivation by Messrs. Veitch.

244. *S. LATIFOLIA* Spring Mon. ii. 168. *Lycopodium latifolium* Hook. & Grev.—Stems erect, 1–1 $\frac{1}{2}$  ft. long, simple in the lower half, deltoid and decompound in the upper half, the branching midway between flabellate and pinnate, the final branchlets reaching a length of 3–4 in.,  $\frac{1}{4}$ – $\frac{1}{3}$  in. broad. Leaves of the lower plane contiguous, oblong-rhomboid, ascending, falcate, subacute at the upper corner, 1–6th to 1–5th in. long, dark green, moderately firm in texture, very unequal-sided, broadly rounded, not ciliated, and hardly at all imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, broad-ovate, with a large cusp. Spikes square,  $\frac{1}{2}$ –1 in. long, 1–12th to 1–8th in. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. Ceylon, New Guinea, Samoa, Fiji.

245. *S. FLABELLATA* Spring Mon. ii. 174. *S. subsplendens* Presl. *S. undulata* Liebm. *Lycopodium flabellatum* Linn. *L. penniforme* Lam. *L. gracile* and *microstachyum* Desv.—Stems 1–2 ft. long, erect, simple in the lower half, deltoid and decompound in the upper half, the pinnæ deltoid, the lower 3–4-pinnate, the contiguous final branchlets  $\frac{1}{4}$ –1 in. long,  $\frac{1}{8}$ – $\frac{1}{6}$  in. broad. Leaves of the lower plane contiguous, oblique ovate, acute, ascending, bright green,

moderately firm in texture, obliquely inserted, much dilated, broadly rounded, ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane one-fourth to a third as long, oblique ovate, cuspidate. Spikes square,  $\frac{1}{2}$ –1 in. long,  $\frac{3}{4}$ – $\frac{1}{2}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. Universal in the tropical and subtropical regions of America, Asia, and Polynesia.

246. *S. FIRMULA* A. Br.; Kuhn Fil. Nov. Hebrid. 17. — Stems above a foot long, stiffly erect, simple in the lower half, with distant adpressed leaves, deltoid and decompound in the upper half, the pinnæ ascending, deltoid, the lower 3–4-pinnate, the final branchlets contiguous,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. broad. Leaves of the lower plane crowded on the branchlets, ascending, oblique ovate, 1–12th to 1–8th in. long, dark green, rather firm in texture, produced, broadly rounded and strongly ciliated on the upper side at the base, and imbricated over the stem; leaves of the upper plane half as long, oblique ovate, cuspidate. Spikes very copious,  $\frac{1}{2}$ –1 in. long,  $\frac{3}{4}$  lin. diam., square; bracts nearly uniform, erecto-patent, ovate-lanceolate, strongly keeled, the sporangia confined to the axils of those of the lower plane, which are consequently more ventricose at the base.

Hab. Aneiteum, *Milne!* *J. G. Veitch!* Ovalau and Angau, Fiji, *Milne* 345! Habit entirely of *S. flabellata*.

247. *S. HORDEIFORMIS* Baker in Journ. Bot. 1885, 47. — Stems 2 ft. long, erect, simple in the lower half, deltoid and decompound in the upper half, the lower pinnæ deltoid and 3–4-pinnate, the contiguous final branchlets  $\frac{1}{4}$ – $\frac{3}{4}$  in. long, under  $\frac{1}{4}$  in. broad. Leaves of the lower plane contiguous, spreading, oblong- or ovate-rhomboid, pointed at the upper corner,  $\frac{1}{6}$ – $\frac{1}{4}$  in. long, bright green, firm in texture, obliquely inserted, broadly rounded, serrulate, but little imbricated over the stem on the upper side at the base; leaves of the upper plane oblong, with a cusp as long as the lamina. Spikes copious, square,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{8}$  in. diam.; bracts ovate, narrowed into a very large awn-like cusp.

Hab. Fiji Islands, *Macleay!*

248. *S. NITENS* Baker in Journ. Bot. 1885, 48. — Stems about a foot long, simple in the lower half, the leaves of the upper part spreading, deltoid and decompound in the upper half, the close pinnæ deltoid, the lower 3–4-pinnate, the erecto-patent contiguous final divisions  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{6}$  in. broad. Leaves of the lower plane contiguous and ascending on the branchlets, spreading on the rachis and pinnæ, deflexed and spaced on the main stem, oblong-lanceolate, acute, bright dark green, moderately firm in texture,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, rather dilated, serrulate, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane small, oblique obovate, with a large cusp. Spikes short, terminal, square,  $\frac{3}{4}$  lin. diam.; bracts ovate-lanceolate, acuminate.

Hab. Fernando Po, *Mann!* Cameroon Mountains, *Kalbreyer!* A nearly of *S. flabellata*.

249. *S. FRUTICULOSA* Spring in Bot. Zeit. 1838, 202. *S. tereticaulis*, *membranacea*, *deliquescens*, *falcata*, and *cataphracta* Spring Mon. ii. 158-182. *Lycopodium fruticosum* Bory. *L. membranaceum*, *falcatum*, and *tereticaulon* Desv.—Stems 1-2 ft. long, erect, simple in the lower half or third, with a few distant adpressed deciduous leaves, deltoid and decomposed upwards, the branching midway between pinnate and flabellate, the lower pinnæ often petioled, the erecto-patent final divisions  $\frac{1}{2}$ -1 in. long,  $\frac{1}{6}$ - $\frac{1}{4}$  in. broad. Leaves of the lower plane contiguous, rather ascending, oblong-lanceolate, falcate, acute, bright green, firm in texture,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long, rather unequal-sided, rounded, shortly ciliated, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane minute, oblique ovate, cuspidate. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. Mountains of Mauritius, Bourbon, and Madagascar. I have failed to draw any clear line between Spring's five species above cited.

250 *S. VOGELII* Spring Mon. ii. 169; Hook. 2 Cent. t. 86. *S. Pervillei* Spring. *S. africana* and *eublepharis* A. Br.—Stems 1-2 ft. long, erect, simple in the lower half, often pink-tinted, with a few distant small adpressed leaves, deltoid and decomposed in the upper half, the lower pinnæ deltoid, petioled, 3-4-pinnate, the contiguous erecto-patent final divisions  $\frac{1}{4}$ - $\frac{3}{4}$  in. long,  $\frac{1}{8}$  in. broad. Leaves of the lower plane spaced even on the branchlets, lanceolate or oblong-lanceolate, ascending, acute, 1-12th to 1-6th in. long, bright green, both edges liable to be revolute, truncate at the base, inserted on the side of the stem, not at all imbricated over the pubescent branches; leaves of the upper plane minute, oblique ovate, with a large cusp. Spikes square,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. Guinea Coast, Cameroon Mountains, Zanzibar, Madagascar. A near ally of the Himalayan *S. fulcrata*. Well known in cultivation. *S. dichrous* Hort. appears to be a form of this species.

251. *S. LÆVIGATA* Baker in Gard. Chron. 1867, 1190. *S. pectinata* Spring. *Lycopodium lævigatum* Lam. *L. pectinatum* Willd.—Stems erect, 1-1½ ft. long, simple in lower half, the leaves small, distant and soon deciduous, deltoid in the upper half, with petioled deltoid 1-2-pinnate pinnæ, the erecto-patent final divisions reaching 2-3 in. long,  $\frac{1}{4}$ - $\frac{1}{3}$  in. broad. Leaves of the lower plane crowded, oblong-lanceolate, subpatent, very falcate, acute,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long, bright green, firm in texture, adnate by a broad base, decurrent on the lower side, cuneate on the upper, not imbricated over the stem; leaves of the upper plane minute, lanceolate, recurved, acute. Spikes square,  $\frac{1}{2}$ -1 in. long,  $\frac{1}{2}$ -1 lin. diam.; bracts ovate, acute, strongly keeled.

Var. *S. Lyallii* Spring Mon. ii. 168. — More compound; lower pinnæ bipinnate, with final divisions  $\frac{1}{2}$ -1 in. long,  $\frac{1}{8}$ - $\frac{1}{6}$  in. broad.

Hab. Madagascar. The two varieties are connected by gradual intermediates.

252. *S. MICRODENDRON* Baker in Journ. Bot. 1885, 116.—Stems erect, a span long, simple in the lower third or quarter, with the



leaves adpressed, stramineous, compound upwards, the pinnæ erecto-patent, lanceolate or deltoid, 1-2-pinnate, the ultimate segments erecto-patent, not contiguous,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, 1 lin. broad. Leaves of the lower plane crowded, erecto-patent, ovate, acute,  $\frac{1}{2}$  lin. long, bright green, rigid, dilated on the upper side at the base, broadly rounded, shortly ciliated, and much imbricated over the stem; leaves of the upper plane minute, oblique ovate, with a short cusp. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate-cuspidate, acutely keeled.

Hab. Cuba, *Wright* 3910! A near ally of *S. caulescens*.

253. *S. PULCHERRIMA* Liebm. — Stems above a foot long, stramineous, erect, simple, with adpressed leaves in the lower two-thirds, deltoid and decompound in the upper third, with 3-4-pinnate close deltoid pinnæ, with ascending contiguous ultimate segments  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, 1 lin. broad. Leaves of the lower plane crowded, ascending, ovate, falcate, acute, bright green, rigid,  $\frac{1}{2}$  lin. long, not ciliated, dilated, broadly rounded, and imbricated over the stem on the upper side at the base; leaves of the upper plane minute, oblique ovate, cuspidate, incurved. Spikes square,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long,  $\frac{1}{2}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. Hacienda de Java, Mexico, *Liebmann*! Midway between *caulescens* and *flabellata*.

254. *S. COARCTATA* Spring Mon. ii. 164, — Stems stiffly erect, stramineous, about a foot long, simple and nearly leafless in the lower part, compound and pubescent upwards; pinnæ petioled, ascending, conduplicate; pinnules subflabellately compound. Leaves of the lower plane very crowded, ascending, falcate, ovate, acute,  $\frac{1}{2}$  lin. long, rigid, minutely serrulate, with an obscure midrib and revolute edges; leaves of the upper plane scarcely smaller, very crowded, ovate, mucronate. Spikes very short; bracts ovate-lanceolate, squarrose.

Hab. On the Rio Negro, at Mount Aracoara, *Martius*. Easily marked in the group by the leaves of both planes being nearly uniform in shape and size.

255. *S. RIONEGRENSIS* Baker in Journ. Bot. 1885, 117. — Stems about a foot long, stramineous, stiffly erect, unbranched in the lower half, the upper leaves of this part slightly spreading, deltoid and decompound in the upper half, the branching of the 2-3-pinnate deltoid ascending pinnæ between flabellate and compound, the ultimate divisions reaching 2-3 in. long,  $\frac{1}{8}$ - $\frac{1}{4}$  in. broad. Leaves of the lower plane crowded, ascending, ovate, acute,  $\frac{1}{2}$ -1 lin. long, bright green, rigid, slightly dilated on the upper side at the base, broadly rounded, obscurely ciliated, much imbricated over the stem; leaves of the upper plane a third as long, oblique ovate, not cuspidate. Spikes square,  $\frac{1}{4}$ - $1\frac{1}{4}$  in. long,  $\frac{3}{4}$ -1 lin. diam.; bracts rigid, lanceolate-deltoid, acuminate, strongly keeled.

Hab. On the Rio Negro, near San Carlos, *Spruce* 2501!

256. *S. PUBERULA* Spring Mon. ii. 165. — Stems erect, stramineous, reaching a length of 2-3 ft., simple towards the base, branched upwards, pubescent; pinnæ short, erecto-patent, sparingly

compound; pinnules few, distant. Leaves of the lower plane ovate, contiguous, ascending, falcate, very acute, bright green, rigid,  $\frac{1}{2}$ –1 lin. long, dilated on the upper side at the base, distinctly ciliated, and imbricated over the stem; leaves of the upper plane half as long, oblique ovate, serrulate, cuspidate. Spikes short, square, 1 lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. British Guiana, *Richd. Schomburgk* 979! Padauri River, Amazon Valley, *Traill* 1417! Mount Guayrapurina, Eastern Peru, *Spruce* 4054!

257. *S. HAENKEANA* Spring Mon. ii. 187. *S. dimorpha* Klotzsch. —Stems about a foot long, erect, simple near the base, with spreading leaves, deltoid and decompound in the upper three-quarters, the lower pinnæ 3–4-pinnate, the contiguous ascending final segments  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1–12th to 1–8th in. broad. Leaves of the lower plane contiguous, ascending, oblong-lanceolate or oblique ovate, acute, 1–12th to 1–8th in. long, bright green, membranous, dilated, strongly ciliated, much rounded, and imbricated over the stem on the upper side at the base; leaves of the upper plane small, oblique obovate, with a cusp as long as the lamina. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. French Guiana, and, according to Spring, also Bolivia and Chili. A near ally of *S. flabellata*.

258. *S. VITICULOSA* Klotzsch in Linnæa xviii. 524. —Stems about a span long, stramineous, simple in the lower part, deltoid and decompound upwards, the pinnæ deltoid, 2–3-pinnate, the root-fibres sometimes extending to the axils of the lowest pinnæ, the contiguous ascending final segments  $\frac{1}{2}$ –1 in. long, 1–12th to 1–8th in. broad. Leaves of the lower plane contiguous, ascending, lanceolate or oblique ovate, acute, 1–12th to 1–8th in. long, bright green, moderately firm in texture, broadly rounded, shortly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblique ovate, cuspidate. Spikes square,  $\frac{1}{2}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. Central America and Venezuela. A near ally of *S. flabellata*.

259. *S. HARTWEGIANA* Spring Mon. ii. 188. —Stems about a foot long, erect, stramineous, simple in the lower half or third, with adpressed leaves, deltoid and decompound upwards, the deltoid pinnæ 3–4-pinnate, the ascending contiguous final segments  $\frac{1}{2}$ –1 in. long, 1–12th to 1–8th in. broad. Leaves of the lower plane contiguous, ascending, ovate, falcate, very acute, 1–12th to 1–8th in. long, bright green, moderately firm in texture, nearly equal-sided, broadly rounded, shortly ciliated, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, broad ovate, cuspidate. Spikes short, square,  $\frac{3}{4}$  lin. diam.; bracts ovate-lanceolate, strongly keeled.

Var. *S. leptoblepharis* A. Br. in Crypt. Nov. Gran. 363. — Less compound, with the leaves of the upper portion of the unbranched part of the stem spreading.

Hab. Andes of New Granada and Ecuador.

260. *S. ERYTHROPUS* Spring Mon. ii. 155. *Lycopodium erythropus* Mart. Icon. Crypt. tab. 20, fig. 3.—Stems about a span long, bright crimson, simple in the lower half or third, deltoid and decompound upwards, the lower pinnæ deltoid 3-pinnate, the ascending contiguous final branchlets  $\frac{1}{2}$ –1 lin. long, 1-12th to 1-8th in. broad. Leaves of the lower plane contiguous, ascending, oblong- or ovate-lanceolate, acute, 1-12th to 1-8th in. long, bright green, moderately firm in texture, unequal-sided, broadly rounded, strongly ciliated, and imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblique ovate, cuspidate. Spikes square,  $\frac{1}{2}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Var. *major* Spring. — More compound, the unbranched part of the stem longer, and all its leaves adpressed.

Hab. Tropical America, from the West Indies and Guatemala to Chili and Central Brazil. *S. setosa* Hort. is a starved small form of this species.

261. *S. HÆMATODES* Spring Mon. ii. 156. *S. flicina* Spring Mon. ii. 189. *Lycopodium hæmatodes* Kunze Farrn. t. 30.—Stems 1–2 ft. long, bright crimson, unbranched in the lower half, with its leaves much spaced and adpressed, deltoid and decompound in the upper half, the deltoid pinnæ 3–4-pinnate, the contiguous erecto-patent ultimate divisions  $\frac{1}{4}$ –1 in. long,  $\frac{1}{8}$ – $\frac{1}{6}$  in. broad. Leaves of the lower plane contiguous, ascending, ovate- or oblong-rhomboid, acute,  $\frac{1}{6}$ – $\frac{1}{3}$  in. long, bright green, moderately firm in texture, dilated on the upper side at the base, not ciliated, broadly rounded, and a little imbricated over the stem; leaves of the upper plane minute, oblique oblong, with a large cusp. Spikes square, reaching 1–1 $\frac{1}{2}$  in. long,  $\frac{1}{2}$ – $\frac{3}{4}$  in. diam.; bracts ovate-lanceolate.

Hab. Andes of Venezuela, Ecuador, and Peru. One of the handsomest of all the known species. Frequent in cultivation.

262. *S. AMAZONICA* Spring Mon. ii. 176. *S. amazonum* Spring in Mart. Fl. Bras. i. 124, t. 6. — Stems 2 ft. or more long, stramineous, erect, simple in the lower half, with adpressed leaves, deltoid and decompound in the upper half, with long, closely regularly pinnate pinnæ, with contiguous erecto-patent simple or slightly compound pinnules, the ultimate divisions reaching 1–2 in. long,  $\frac{1}{6}$  in. broad. Leaves of the lower plane contiguous, erecto-patent, lanceolate- or oblong-rhomboid, subacute, 1-12th to 1-6th in. long, bright green, moderately firm in texture, nearly equal-sided, rounded on the upper side at the base and a little imbricated over the stem, cuneate-truncate on the lower; leaves of the upper plane a third as long, oblique ovate, acute. Spikes square,  $\frac{1}{2}$ –1 in. long, 1 lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. Amazon Valley, *Martius*, *Spruce* 2053! 2358!

263. *S. OAXACANA* Spring Mon. ii. 177. — Stems 1 $\frac{1}{2}$ –2 ft. long, erect, stramineous, simple in the lower half, with adpressed leaves, deltoid and decompound in the upper half, the leaves of the main stem ovate-oblong, obtuse, very ascending, the pinnæ elongated, closely 3–4-pinnate, the contiguous erecto-patent final divisions  $\frac{1}{4}$ –1 $\frac{1}{2}$  in. long,  $\frac{1}{8}$ – $\frac{1}{6}$  in. broad. Leaves of the lower plane sub-contiguous, erecto-patent, lanceolate-rhomboid, subacute, 1-12th to



1-6th in. long, dark green, moderately firm in texture, dilated, broadly rounded, not ciliated, imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblong, shortly cuspidate. Spikes short, square,  $\frac{1}{2}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Hab. Mexico, in the province of Oaxaca, *Galeotti* 6808 *bis*. Chiapas, *Gheisbrecht* 602! A near ally of *S. flabellata*.

264. *S. ANCEPS* A. Br. in. Fil. Nov. Gran. 362. *S. Sprucei* A. Br. *loc. cit.* *S. flabellata* Spring, ex parte. *Lycopodium anceps* Presl.—Stems 1-2 ft. long, erect, stramineous, simple in the lower half, with entirely adpressed leaves, deltoid and 2-3-pinnate in the upper half, the contiguous erecto-patent ultimate segments reaching 2-3 in. long,  $\frac{1}{4}$ - $\frac{1}{3}$  in. broad. Leaves of the lower plane crowded, ascending, lanceolate-rhomboid, acute,  $\frac{1}{6}$ - $\frac{1}{3}$  in. long, bright green, moderately firm in texture, dilated, cordate, shortly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblique ovate, acute. Spikes square, reaching 1-1 $\frac{1}{2}$  in. long, 1 lin. diam.; bracts ovate-lanceolate, strongly keeled.

Hab. Andes of Venezuela, New Granada, Ecuador, and Peru. Habit less compound than in *flabellata*, and leaves much larger.

### Group 2.—*Geniculatae*.

265. *S. PARKERI* Spring Mon. ii. 226. *S. lucidinervia* Spring. *Lycopodium Parkeri* Hook. & Grev. *L. plumosum* Aublet!—Stems 1-1 $\frac{1}{2}$  ft. long, simple in the lower half or two-thirds, articulated, stramineous, distinctly articulated, deltoid and decompound in the upper part, with petioled bipinnate deltoid lower pinnæ, long lanceolate penultimate divisions with a flexuose rachis, and contiguous erecto-patent final divisions  $\frac{1}{2}$ -1 in. long,  $\frac{1}{4}$ - $\frac{1}{3}$  in. broad. Leaves of the lower plane contiguous, lanceolate-rhomboid, ascending, pointed at the upper corner,  $\frac{1}{6}$ - $\frac{1}{4}$  in. long, bright green, moderately firm in texture, auricled on both sides of the narrow base, unequal-sided, broadly rounded on the upper side at the base, and a little imbricated over the stem; leaves of the upper plane a third to one-fourth as long, lanceolate, acute. Spikes short, 1 lin. diam.; bracts ovate-cuspidate, acutely keeled.

Var. *S. pedata* Klotzsch in Linnæa xviii. 521. *S. nodosa* Kunze.—Branched portion of the stem more compound, with narrower divisions, shorter leaves of the lower plane, and longer more slender spikes.

Var. *S. stellata* Spring Mon. ii. 228. *S. calcarata* A. Br. in Crypt. Nov. Gran. 389.—Upper part of stem copiously compound, lengthened out, and taking root at the tip.

Var. *S. Vanheurckiana* Spring. *S. fragilis* A. Br. in Crypt. Nov. Gran. 389.—Stems slender and trailing, bipinnate above the simple base, gradually lengthened out upwards with a long whip-like radican end.

Hab. Guiana and the Amazon Valley. This is probably the “*planta muscosa et plumosa guayanensis perelegans minor*” of Breynius Ic. t. 101, cited by Linnæus under his *L. plumosum*.

266. *S. ASPERULA* Spring Mon. ii. 225. *Lycopodium asperulum* Mart. — Stems about a foot long, erect, articulated, stramineous, simple in the lower half with adpressed leaves, compound in the upper half with broad erecto-patent pinnæ 2-4 in. long, with distant sparingly subflabellately compound erecto-patent pinnules, the final divisions  $\frac{1}{2}$ -1 in. long, 1-12th in. diam. Leaves of the lower plane crowded, ascending, ovate, acute,  $\frac{1}{2}$ -1 lin. long, bright green, firm in texture, broadly rounded and shortly rigidly ciliated on the upper side at the base, and a little imbricated over the stem; leaves of the upper plane a third as long, oblique ovate, acute. Spikes short, square,  $\frac{3}{4}$ -1 lin. diam.; bracts ovate-cuspidate, sharply keeled.

Hab. Amazon Valley, *Spruce* 1317! *Traill* 1420! 1421! Ceara, *Gardner*! Bahia, *Martius*!

267. *S. GENICULATA* Spring Mon. ii. 227. *S. ferruminata* and *conduplicata* Spring Mon. ii. 229-230. *S. elongata* Klotzsch. *Lycopodium geniculatum* Presl.—Stems 2-3 ft. long, simple, stramineous and very distinctly jointed in lower two-thirds or three-quarters, deltoid and decompound upwards, with 3-pinnate lower pinnæ, all the divisions ascending and pinnately arranged, the final ones contiguous, 1-2 in. long,  $\frac{1}{8}$ - $\frac{1}{4}$  in. broad, their rachis also, like the main stem, conspicuously articulated. Leaves of the lower plane contiguous, ascending, ovate, or ovate-lanceolate, acute, 1-12th to 1-6th in. long, bright green, moderately firm in texture, truncate at the base, not at all imbricated over the stem, entire or obscurely serrulate; leaves of the upper plane a third as long, ovate-lanceolate. Spikes square,  $\frac{1}{2}$ - $\frac{3}{4}$  lin. diam.; bracts ovate-cuspidate, strongly keeled.

Var. *S. tomentosa* Spring Mon. ii. 231. — Branches pubescent, divisions  $\frac{1}{8}$ - $\frac{1}{2}$  in. broad.

Hab. Costa Rica and Nicaragua to the Amazon Valley and Peru.

268. *S. SUBARBORESCENS* Hook. 2 Cent. Ferns, t. 84. *S. euryclada* A. Br. in Crypt. Nov. Gran. 388. — Stems reaching a height of 4-5 ft., simple and unbranched in the lower three-quarters, stramineous, distinctly articulated, deltoid and frond-like at the top, with long-stalked ascending lower bipinnate pinnæ, with the branching midway between flabellate and pinnate, the final divisions reaching 4-6 in. long,  $\frac{1}{2}$  in. broad. Leaves of the lower plane contiguous, lanceolate-rhomboid, patent with a falcate acute tip,  $\frac{1}{4}$ - $\frac{1}{3}$  in. long, bright green, moderately firm in texture, nearly equal-sided, not imbricated over the stem at the base, cut away on the upper, produced and square on the lower side; leaves of the upper plane one-fourth as long, lanceolate, acute, much imbricated. Spikes short, square, 1 lin. diam.; bracts ovate-cuspidate, acutely keeled.

Hab. Amazon Valley, in forests of the Rio Uapes, *Spruce* 2540!

### Subgenus III.—HOMOSTACHYS.

269. *S. CILIARIS* Spring Mon. ii. 233, excl. syn. *Lycopodium ciliare* Retz.—Habit of *S. serpens*. Stems trailing, reaching  $\frac{1}{2}$  ft. in

length, pinnate, the branches erecto-patent, the lower copiously compound. Leaves of the lower plane spaced below the tip of the branchlets, spreading, ovate-oblong, subobtusely,  $\frac{1}{3}$  in. long, very unequal-sided, cordate and conspicuously ciliated, and imbricated over the stem on the upper side at the base; leaves of the upper plane much smaller, cordate-ovate, aristate. Spikes short, not resupinate; bracts of both planes resembling the leaves in shape and arrangement.

Hab. Ceylon, *König*. I have not found this amongst our large set of Ceylon specimens. Of the synonyms cited by Spring, Lamarck's plant is our *S. proniflora*, and Hooker & Greville's is *S. tenera*.

270. *S. PALLIDISSIMA* Spring Mon. ii. 234.—Stems 3-6 in. long, much intermatted, forked low down and pinnate, the branches simple or sparingly compound. Leaves of the lower plane spaced below the tip of the branches, spreading, ovate, acute, a line long, pale green, membranous, very unequal-sided, very cordate on the upper side at the base, shortly ciliated, much imbricated over the stem; leaves of the upper plane half as long, ovate, shortly cuspidate. Spikes not resupinate,  $\frac{1}{2}$ -1 in. long,  $\frac{1}{8}$  in. broad, sometimes forked; bracts of the lower plane ovate, acute, erecto-patent, slightly imbricated; of the upper plane little smaller, suberect, much imbricated.

Hab. Temperate region of the Central Himalayas, ascending in Kumaon to 8000-9000 ft.

#### Subgenus IV. HETEROSTACHYS.

##### Group 1.—*Bisulcatæ*.

271. *S. BURBIDGEI* Baker in Journ. Bot. 1885, 154. — Stems slender, trailing, stramineous, intermatted, angled on the face, copiously pinnate, the distant erecto-patent branches sparingly compound. Leaves of the lower plane spaced even on the branches, rather ascending on the branches, spreading on the main stem, broad cordate-ovate, subacute, bright green, rather firm in texture,  $\frac{3}{4}$ -1 lin. long, cordate, strongly ciliated and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, cordate-ovate, with a short cusp. Spikes resupinate,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, 1 lin. diam.; bracts of the upper plane nearly patent, oblique lanceolate, acute; those of the lower plane very different, ovate-lanceolate, with a long cusp, ascending, strongly keeled, and strongly ciliated.

Hab. Landakan, Borneo, *Burbidge*! A very well-marked species.

272. *S. BECCARIANA* Baker in Journ. Bot. 1885, 154.—Stems slender, trailing,  $\frac{1}{2}$  ft. long, forked and copiously pinnate, rounded on the back, sulcate upwards on the face. Leaves of the lower plane spaced on the main stem, rather ascending, oblique ovate, acute,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long, dark green, moderately firm in texture, much more produced on the upper side of the midrib, broadly rounded, shortly ciliated, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane very small, ovate or ovate-lanceolate, acute. Spikes resupinate,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, 1 lin.



diam.; bracts of the upper plane crowded, ovate-navicular, dark green, erecto-patent; of the lower plane smaller, ascending, broad ovate-cuspidate, strongly keeled.

Hab. Mount Singalan, West Sumatra, 5000—6000 ft., *Beccari*! Habit and branching of the small forms of *radicata*.

273. *S. BISULCATA* Spring Mon. ii. 259.—Stems slender, trailing, except towards the tip, a foot long, flat or bisulcate down the face, copiously pinnate, the branches short, deltoid and flabellately compound. Leaves of the lower plane contiguous on the branchlets, spaced on the main stem, spreading, the lower slightly squarrose, oblong-rhomboid, subacute,  $\frac{1}{8}$ — $\frac{1}{6}$  in. long, bright green, moderately firm in texture, rounded and slightly ciliated on the upper side at the base, hardly at all imbricated over the stem; leaves of the upper plane half as long, obovate or oblong, with a large cusp. Spikes short, resupinate,  $\frac{1}{6}$  in. diam.; bracts very dimorphous, those of the upper plane lanceolate-rhomboid, the lower ones patent; those of the lower plane suborbicular, with a large strongly-keeled cusp.

Hab. Himalayas of Nepaul and Assam.

274. *S. GORVALENSIS* Spring Mon. ii. 256. — Stems slender, trailing, above a foot long, with root-fibres extending to the top, dichotomously forked at the base and upwards, distantly bipinnate, with short ascending slightly compound branches. Leaves of the lower plane slightly spaced except on the branchlets, ascending, ovate-oblong, subobtuse  $\frac{1}{8}$ — $\frac{1}{6}$  in. long, dark green, firm in texture, very unequal-sided, very cordate, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate-cuspidate. Spikes short, resupinate, 1 lin. diam.; bracts obscurely dimorphic, those of the upper plane ovate-lanceolate, rigidly erecto-patent; of the lower plane rather shorter, paler, more ventricose, and more ascending.

Hab. Himalayas; Gurwhal, *Griffith*!

## Group 2.—*Pronifloræ*.

275. *S. INTERTEXTA* Spring Mon. ii. 237. — Stems very slender, trailing, intermatted, 1–2 in. long, pinnate, the branches erecto-patent, the lower slightly compound. Leaves of the lower plane spaced on the main stem, erecto-patent, suborbicular, subobtuse,  $\frac{1}{3}$  lin. long, convex on the face, firmer in texture than in *S. integririma*, nearly equal-sided, broadly rounded and strongly ciliated on the upper side at the base, and a little imbricated over the stem; leaves of the upper plane not much smaller, oblique ovate, cuspidate. Spikes very short, resupinate,  $\frac{1}{2}$  lin. diam.; bracts of the upper plane ovate, acute, erecto-patent; of the lower plane ovate, erect.

Hab. Philippines, *Cuming* 2015! A very distinct species.

276. *S. KIRKII* Baker in Journ. Bot. 1885, 176. — Stems continuous, trailing, 6–9 in. long, with rootlets from nearly all the nodes; branches short, ascending, with a few short branchlets,

Leaves of lower plane very lax on the branches, only the few upper ones of final branchlets contiguous, oblong-lanceolate, acute, bright green, membranous,  $\frac{1}{8}$  in. long, rounded on both sides at the base; midrib central; leaves of upper plane a third as long, ascending, oblique oblong-lanceolate. Spikes short; bracts bright green, membranous, linear-oblong,  $\frac{1}{2}$  lin. long; smaller ovate, acute.

Hab. Usagura Mountains, East Tropical Africa, *Sir J. Kirk*! Habit of *S. fissidentoides*.

277. *S. XIPHOLEPIS* Baker in Journ. Bot. 1885, 155. — Stems slender, decumbent, 2–3 in. long, sometimes forked at the base, the distant erecto-patent branches simple or little compound. Leaves of the lower plane crowded even on the main stem, spreading, oblique ovate, acute,  $\frac{3}{4}$ –1 lin. long, bright green, membranous, unequal-sided, very cordate, shortly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, crowded, shortly cuspidate. Spikes resupinate,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, above 1 lin. diam.; bracts of the upper plane oblique lanceolate, a line long, very crowded, stiffly erecto-patent; of the lower plane ovate-lanceolate, ascending, much imbricated.

Hab. Hong-kong, *C. Wright*!

278. *S. SANDVICENSIS* Baker in Journ. Bot. 1885, 155. — Stems very slender, decumbent,  $1\frac{1}{2}$ –2 in. long, the root-fibres only near the base, pinnate, the upper branches simple, the lower slightly compound. Leaves of the lower plane spaced on the main stem, contiguous on the branches, erecto-patent, oblique ovate, acute,  $\frac{1}{2}$  lin. long, bright green, membranous, unequal-sided, cordate, shortly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane much smaller, ovate, acute. Spikes short, resupinate, 1 lin. diam.; bracts of the upper plane erecto-patent, oblique lanceolate; of the lower plane ovate-cuspidate, ascending, strongly keeled.

Hab. Sandwich Islands, *Menzies*! in herb. Smith.

279. *S. PRONIFLORA* Baker in Journ. Bot. 1885, 156. *S. Belangeri* Spring Mon. ii. 242. *S. reticulata* Spring Mon. ii. 235. *S. myosuroides* and *nudicaulis* Spring. *S. imbricata* J. Scott List. Calc. 62. *Lycopodium proniflorum* Lam. *L. imbricatum* Roxb. *L. Belangeri* Bory in Belang. Voy. Bot. tab. 1, fig. 2. *L. remotifolium* Desv. *L. reticulatum* Hook. & Grev. — Stems very slender, trailing, 1–4 in. long, often forked at the base, copiously pinnate, the erecto-patent branches simple or little compound. Leaves of the lower plane spaced below the tip of the branches, spreading, ovate, acute, a line long, pale green, membranous, very unequal-sided, very cordate, strongly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, cordate-ovate, acute, not cuspidate. Spikes resupinate,  $\frac{1}{4}$ – $\frac{3}{4}$  in. long,  $\frac{1}{8}$ – $\frac{1}{6}$  in. diam.; bracts of the upper plane erecto-patent, oblong-lanceolate, much imbricated,  $\frac{3}{4}$ –1 lin. long; bracts of the lower plane paler, much more ascending, shorter, ovate-cuspidate, strongly ciliated.

Hab. Throughout India from the Eastern Himalayas to Ceylon, the Malay

Islands and North Australia. *S. reticulata* Spring is simply a dwarf form of this species. I cannot by the description separate *S. Junghuhniana* Spring in Pl. Junghuhn. 277.

280. *S. PHANOTRICHA* Baker in Journ. Bot. 1885, 156. *S. ciliaris* Cesati Fil. Born. 36, non Spring.—Stems very slender, trailing, 3–4 in. long, forked low down, copiously pinnate, the branches erecto-patent, the lower slightly compound. Leaves of the lower plane contiguous on the branches, rather spaced on the stem, spreading, ovate, acute, under a line long, rather firmer in texture than in *S. proniiflora*, very unequal-sided, very cordate, strongly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, cuspidate. Spikes resupinate, short, 1 lin. diam.; bracts of the upper plane oblique ovate, acute, imbricated, erecto-patent; of the lower plane ovate-cuspidate, suberect.

Hab. Borneo, on shady rocks at Labuan, Barber 134! Sarawak, Beccari!

281. *S. HARVEYI* Baker in Journ. Bot. 1885, 156.—Stems slender, trailing, 3–4 in. long, sometimes forked low down, copiously pinnate, the erecto-patent branches short, simple or slightly compound. Leaves of the lower plane contiguous on the branches, spaced in the lower part of the stem, spreading, oblong, obtuse, membranous,  $\frac{3}{4}$ –1 in. long, nearly equal-sided, subcordate on both sides at the base, serrulate, hardly at all imbricated over the stem; leaves of the upper plane a third as long, ovate, acute, imbricated. Spikes  $\frac{1}{4}$ – $\frac{1}{3}$  in. long,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam., resupinate; bracts not very distinctly dimorphous, those of the upper plane ovate, acute, erecto-patent; of the lower plane paler and rather shorter, especially towards the base of the spike.

Hab. Friendly Islands, Dr. Harvey!

282. *S. LEPTOPHYLLA* Baker in Journ. Bot. 1885, 157.—Stems very weak and slender, trailing, densely tufted, 2–3 in. long, distantly pinnate, the branches erecto-patent, the lower slightly compound. Leaves of the lower plane very distant, even on the branches, rather ascending, oblique oblong, subobtuse, a line long, bright green, very membranous, more produced on the upper side of the midrib, broadly rounded, not ciliated, and imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, shortly cuspidate. Spikes resupinate,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, 1–12th to 1–8th in. diam.; bracts very dimorphous, those of the upper plane oblique oblong-lanceolate, erecto-patent; of the lower plane ascending, ovate-cuspidate, strongly keeled.

Hab. Formosa, at Tamsuy, Oldham 79! A near ally of *S. proniiflora*.

283. *S. WATTHI* Baker.—Stems very slender, trailing, 2–3 in. long; branches short, distant, erecto-patent, upper simple, lower compound. Leaves membranous, those of the lower plane spaced out, ovate, 1–12th in. long, produced on the upper side, clasping the stem, ciliate-denticulate, cordate on both sides at the base; of the upper plane very small. Spikes short; bracts very dimorphic, those of the upper plane oblique oblong, erecto-patent, 1–12th in.



long, with a very distinct midrib; the others ascending, ovate, with a large cusp, strongly ciliated.

Hab. Manipur, *Watt* 6670! A very membranous and fugacious species, allied to *S. proniflora* and *S. leptophylla*.

284. *S. HETEROSTACHYS* Baker in Journ. Bot. 1885, 177.—Stems very slender, trailing, 2–4 in. long, pinnate, the branches erecto-patent, the central and lower sometimes considerably compound. Leaves of the lower plane slightly spaced on the branches, very much so on the main stem, spreading, oblique ovate, acute, a line long, pale green, membranous, dilated on the upper side at the base, slightly cordate, serrulate, and a little imbricated over the stem; leaves of the upper plane half as long, broad ovate, with a distinct cusp. Spikes  $\frac{1}{6}$ – $\frac{1}{4}$  in. long, resupinate,  $\frac{3}{4}$ –1 lin. diam.; bracts not always distinctly dimorphous, those of the upper plane usually ovate-lanceolate and erecto-patent; of the lower plane ovate, acute, ascending.

Hab. Hong-kong, *C. Wright*! Northern China, *Dr. Hance* 7491!

285. *S. SAMOENSIS* Baker in Journ. Bot. 1885, 177.—Stems trailing, slender, 3–6 in. long, copiously pinnate, the branches erecto-patent, the lower often copiously compound. Leaves of the lower plane spaced even on the branches, spreading, oblique oblong, obtuse, a line long, bright green, membranous, firmer in texture than in *proniflora*, more produced on the upper side of the midrib, broadly rounded, serrulate and slightly imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, ovate, not cuspidate. Spikes copious, resupinate,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts very dimorphous, those of the upper plane ovate-lanceolate, spreading or erecto-patent, slightly squarrose; those of the lower plane ascending, ovate, cuspidate.

Hab. Samoa, *Powell*! *J. G. Veitch*! *Whitmee*!

286. *S. VITIENSIS* Baker in Journ. Bot. 1885, 177. — Stems slender, trailing, 4–6 in. long, copiously pinnate, the lower branches elongated and copiously compound. Leaves of the lower plane spaced even on the branchlets, spreading, oblong, obtuse, membranous,  $\frac{3}{4}$ –1 lin. long, more produced on the upper side of the midrib, broadly rounded and shortly ciliated on the upper side at the base, and very slightly imbricated over the stem; leaves of the upper plane a third as long, oblong, not cuspidate. Spikes short, resupinate,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam.; bracts of the upper plane ovate-lanceolate, erecto-patent; of the lower plane little shorter, ovate, acute, ascending, strongly keeled.

Hab. Fiji Islands, *Daemel*!

287. *S. ALUTACEA* Spring Mon. ii. 237. — Stems very slender, trailing, forked low down, copiously pinnate, the branches erecto-patent, the lower copiously compound. Leaves of the lower plane spaced on the main stem, spreading, ovate, subacute,  $\frac{3}{4}$ –1 lin. long, bright green, firmer in texture than in *S. proniflora*, very unequal-sided, very cordate, strongly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane

a third to one-fourth as long, cordate-ovate, cuspidate. Spikes copious, resupinate,  $\frac{1}{2}$ –1 in. long, 1 lin. diam., sometimes forked; bracts of the upper plane ovate-lanceolate, acute, very crowded, erecto-patent; bracts of the lower plane ovate-cuspidate, pale, much imbricated.

Var. *sphaerophylla* Baker.—Leaves of the lower plane smaller, crowded, suborbicular, firmer in texture, concave on the face. Spikes narrower, with less dimorphic bracts.

Hab. Damp banks on Penang Hill, *Pinwill*! *Maingay* 1831! *Sir W. Norris*!

288. *S. BRACKENRIDGEI* Baker in Journ. Bot. 1885, 178. *S. ciliaris* Bracken., non Spring.—Stems decumbent, slender, terete, 3–4 in. long, bisulcate down the face, copiously pinnate, the ascending branches considerably compound. Leaves of the lower plane contiguous on the branches, spaced on the main stem, spreading, oblique oblong, obtuse,  $\frac{3}{4}$ –1 lin. long, pale green, membranous in texture but firmer than in *S. proniflora*, unequal-sided, cordate, shortly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, shortly cuspidate. Spikes copious, resupinate,  $\frac{1}{4}$  in. long,  $\frac{3}{4}$  lin. diam.; bracts of the upper plane erecto-patent, oblique ovate-lanceolate; of the lower plane shorter, ovate, acute, pale, ascending, strongly keeled.

Hab. Fiji, behind the town of Muthuata, *Brackenridge*! *Daemel* 191! Intermediate in habit between *serpens* and *proniflora*.

289. *S. BONINENSIS* Baker in Journ. Bot. 1885, 178.—Stems trailing, very slender, 2–3 in. long, copiously pinnate, all the branches short and simple. Leaves of the lower plane slightly spaced on the stem, spreading, oblong or oblong-lanceolate, acute, a line long, pale green, membranous, unequal-sided, denticulate, not distinctly ciliated on the upper edge, cordate on the upper side at the base, and imbricated over the stem; leaves of the upper plane half as long, ovate-lanceolate, cuspidate. Spikes short, resupinate,  $\frac{1}{8}$  in. diam.; bracts of the upper plane crowded, lanceolate, erecto-patent, a line long; of the lower plane ovate-lanceolate, ascending.

Hab. Bonin Islands, *Wright* 371! Resembles *S. integerrima* in its habit and leaves. It is the Bonin plant referred by Spring to *S. pallida*.

290. *S. ZEYLANICA* Baker in Journ. Bot. 1885, 178.—Habit of *S. integerrima*. Stems slender, trailing, intermatted, 2–3 in. long, forked low down, sparingly pinnate. Leaves of the lower plane spaced on the main stem, spreading, oblique ovate, acute, a line long, pale green, membranous, very unequal-sided, very cordate, minutely ciliated, and imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, cordate-ovate, distinctly cuspidate. Spikes resupinate,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts of the upper plane ovate, imbricated, erecto-patent; of the lower plane ovate-cuspidate, ascending, yellowish.

Hab. Ceylon, *Gardner*! Differs from *S. integerrima* by its distinctly dimorphous bracts and cuspidate leaves of the upper plane.

291. *S. OTTONIS* Baker in Journ. Bot. 1885, 179.—Stems

slender, entirely trailing, 2-3 in. long, distantly pinnate, some of the short branches with 3-4 erecto-patent branchlets. Leaves of the lower plane close and ascending on the branches, rather spaced and spreading on the main stem, oblique ovate, acute,  $\frac{1}{2}$  lin. long, pale green, membranous, ciliated all down the upper edge, very cordate, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, broad ovate, cuspidate, shortly ciliated. Spikes short, resupinate,  $\frac{3}{4}$  lin. diam.; bracts of the lower plane oblique ovate-lanceolate, erecto-patent; of the upper plane ovate-cuspidate, yellowish, ascending, strongly ciliated.

Hab. Cuba, *Otto* 231!

292. *S. RHODOSTACHYA* Baker in Trans. Linn. Soc. ser. 2, ii.—Stems decumbent,  $\frac{1}{2}$  ft. long; main branches elongated; branchlets distant, erecto-patent, simple, or little compound. Leaves firm in texture, pale green or tinged with red; those of the lower plane ascending, spaced out except at the tip of the branchlets, ovate-oblong, obtuse, rather unequal-sided, 1-16th in. long, ciliato-denticulate all round; leaves of the upper plane smaller, ovate, ascending. Spikes very short; bracts similar to the leaves in shape and texture.

Hab. British Guiana; Mount Roraima, *Im Thurn*!

293. *S. CONSIMILIS* Baker in Journ. Bot. 1885, 179.—Stems very slender, trailing, intermatted, 3-4 in. long, distantly pinnate, the branches short and simple. Leaves of the lower plane spaced, spreading, oblong-lanceolate, acute, a line long, pale green, very thin, nearly equal-sided, obscurely ciliated on both sides at the base, broadly rounded on the upper, and scarcely at all imbricated over the stem; leaves of the upper plane half as long, ovate-lanceolate, acuminate. Spikes short, copious, resupinate,  $\frac{1}{8}$  in. diam.; bracts slightly dimorphic, those of the upper plane ovate-lanceolate, acuminate, erecto-patent, a line long; those of the lower plane smaller, paler, more ascending.

Hab. Cuba, *Wright*, 3907! General habit very like that of *S. apus* and *brasiliensis*.

294. *S. CORDIFOLIA* Spring Mon. ii. 103. *S. cordata* Klotzsch. *Lycopodium cordifolium* Desv.—General habit and branching of *S. serpens*, the trailing stem reaching a foot long, the short branches often excurrent and whip-like at the tip, the lower copiously compound. Leaves of the lower plane contiguous on the branches, spaced on the main stem, ovate-lanceolate, very acute, pale green, membranous, above a line long, ciliated on the upper edge, dilated and subcordate, and imbricated over the stem on the upper side at the base; leaves of the upper plane much smaller, ovate-lanceolate, cuspidate. Spikes very short, resupinate, with dimorphous bracts.

Hab. San Domingo and Porto Rico. I have not seen this, and place it amongst the platystachyoid species on A. Braun's authority.



Group III.—*Brachystachya*.

295. *S. BRACHYSTACHYA* Spring Mon. ii. 255. *Lycopodium brachystachyum* Hook. & Grev.—Stems reaching a foot or more in length, generally assurgent from a decumbent base, bisulcate down the face, copiously compound, the final branching midway between pinnate and flabellate. Leaves of the lower plane contiguous on the branchlets, spaced on the main stem, spreading or rather ascending, oblong-rhomboid, obtuse, one-sixth to one-fifth in. long, dilated on the upper side at the base, cordate, not ciliated, much imbricated over the stem; leaves of the upper plane small, ovate, with a cusp as long as the lamina. Spikes resupinate,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{8}$  in. diam.; bracts of the upper plane oblique lanceolate, erecto-patent; of the lower plane ovate-lanceolate, ascending.

Var. *S. ornata* Spring Mon. ii. 259. *S. fimbriata* Spring Mon. ii. 258. *Lycopodium ornatum* Hook. & Grev.—Stem erect from the base. Leaves smaller, more rigid and more ascending. Spikes longer and narrower,  $\frac{1}{2}$ –1 in. long, with less distinctly dimorphous bracts.

Hab. Khasia Mountains, Malay Islands, Ceylon and Mauritius.

296. *S. WRAYI* Baker—Stems densely tufted,  $\frac{1}{2}$  ft. long, bipinnate; branches and branchlets ascending. Leaves moderately firm in texture, bright green, those of the lower plane oblique ovate,  $\frac{1}{6}$  in. long, more rounded on the upper side at the base, those of the upper plane much smaller, ascending, ovate aristate. Spikes  $\frac{1}{6}$ – $\frac{1}{4}$  in. long; larger bracts erecto-patent, rigid, ovate, acute; smaller more ascending, paler, ovate cuspidate.

Hab. Perak, *Wray* 668!

297. *S. MEGAPHYLLA* Baker in Journ. Bot. 1885, 180.—Stems  $\frac{1}{2}$ –1 ft. long, assurgent from a decumbent base, with very long root-fibres, the branches copiously compound, deeply sulcate down the face. Leaves of the lower plane contiguous except low down the stem, patent from an oblique base, linear-oblong, obtuse,  $\frac{1}{6}$ – $\frac{1}{4}$  in. long, 3–4 times as long as broad, bright green, moderately firm in texture, serrulate, rounded and a little imbricated over the stem on the upper side at the base; leaves of the upper plane ovate-lanceolate, cuspidate. Spikes short, resupinate,  $\frac{1}{8}$  in. diam.; bracts of the upper plane lanceolate-acuminate, rigidly erecto-patent; of the lower paler, rather shorter, more ascending.

Hab. Mishmi, East Himalayas, *Griffith*!

298. *S. SQUARROSA* Baker in Journ. Bot. 1885, 180.—Stems about a foot long, trailing and sending out copious root-fibres in the lower half, assurgent, deeply bisulcate down the face, copiously pinnate, the branches copiously compound. Leaves of the lower plane spreading and contiguous on the branches, spaced and rather squarrose on the main stem, oblong-rhomboid, subacute at the upper corner, one-sixth to one-fifth in. long, bright green, moderately firm in texture, not ciliated, dilated, cordate and much imbricated over the stem on the upper side at the base; leaves of the upper plane small, ovate, with a cusp as long as the lamina.

Spikes short, resupinate,  $\frac{1}{8}$  in. diam.; bracts of the upper plane lanceolate, spreading, squarrose; of the lower plane ovate cuspidate, ascending.

Hab. Cameroon Mountains, alt. 4000 ft., *Mann* 1407! Sierra de Crystal, *Mann* 1638!

299. *S. MANNII* Baker in Journ. Bot. 1885, 180.—Stems  $\frac{1}{2}$ –1 ft. long, assurgent from a decumbent base, from which arise several large stout root-fibres, bisulcate down the face, closely pinnate, the erecto-patent branches copiously compound. Leaves of the lower plane contiguous on the branches, rather spaced on the main stem, ascending, ovate- or oblong-rhomboid, subacute at the upper corner,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, bright green, firm in texture, dilated, shortly ciliated, cordate, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate-cuspidate. Spikes  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam., resupinate; bracts of the upper plane ovate-lanceolate, rigidly erecto-patent; of the lower plane shorter, ovate-cuspidate, more ascending, ventricose, acutely keeled.

Hab. Island of St. Thomas, West Tropical Africa, alt. 5000 ft., *Mann* 1108!

#### Group 4.—*Suberosæ*.

300. *S. PUMILIO* Spring Mon. ii. 241. *Lycopodium pumilio* R. Br. —Stems very slender, erect, nearly simple, under an inch long, with root-fibres confined to the base. Leaves of the lower plane spaced, ovate, acute, denticulate,  $\frac{1}{2}$  lin. long, membranous, nearly equal-sided; leaves of the upper plane a third as long, ovate, acute. Spikes very short, resupinate; bracts dimorphous, those of the upper plane ovate, acute, erecto-patent; of the lower plane ovate-cuspidate, ascending.

Hab. Endeavour River, Australia, *Sir J. Banks*!

301. *S. MINUTIFOLIA* Spring Mon. ii. 239.—Stems densely tufted, very slender, erect, pale straw-coloured, 2–3 in. long, copiously pinnate, the branches erecto-patent, the lower slightly compound. Leaves of the lower plane very distant, erecto-patent, ovate, acute,  $\frac{1}{4}$  lin. long, membranous, serrulate, broadly rounded on the upper side at the base, and imbricated over the stem; leaves of the upper plane also spaced, a third as long, ovate, acute. Spikes copious, very small, under a line in diameter, resupinate; bracts of the upper plane oblong-lanceolate, bright green, erecto-patent, crowded rather squarrose; of the lower plane ascending, ovate-cuspidate, pale.

Hab. Woods of Tenasserim, at Mergui and Moulmein, *Griffith*! *Helper*! *Boulger*! One of the smallest species of the genus.

302. *S. ZOLLINGERIANA* Spring in Pl. Junghuhn. 278. —Stems very slender, erect, 1–1 $\frac{1}{2}$  in. long, pinnate, the branches erecto-patent, the lower slightly compound. Leaves of the lower plane very distant, lanceolate, acute,  $\frac{1}{2}$  lin. long, pale green, membranous, nearly equal-sided, minutely denticulate; leaves of the upper plane a third smaller, ovate-lanceolate. Spikes resupinate,  $\frac{1}{6}$ – $\frac{1}{3}$  in. long; bracts of the upper plane erecto-patent, ovate-lanceolate, unequal-

sided; of the lower plane a third shorter, more ascending, ovate-cuspidate.

Hab. Java, *Zollinger* 2226! Celebes, *Zollinger* 3313!

303. *S. HORNEI* Baker in Journ. Bot. 1885, 248. — Stems about an inch long, very slender, erect, 2–3-times dichotomously forked. Leaves of the lower plane spaced, rather ascending, oblique oblong, obtuse, nearly a line long, bright green, membranous, nearly equal-sided, broadly rounded, shortly ciliated, and slightly imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, ovate, acute. Spikes very short, resupinate, 1 lin. diam.; bracts of the upper plane ovate-lanceolate, erecto-patent; of the lower plane shorter, acute, ascending, pale.

Hab. Fiji Islands, *Horne*!

304. *S. NANA* Spring Mon. ii. 240. — Stems very slender, erect from a creeping base, 2 in. long, the upper branches simple and erecto-patent, the lower spreading and slightly compound. Leaves of the lower plane rigid in texture, subcontiguous, ovate-oblong, subobtuse, a line long, nearly equal-sided, ciliated at the base on the upper side; leaves of the upper plane half to a third as long, ovate, apiculate. Spikes short, resupinate; bracts of the upper plane ovate-lanceolate, acute; of the lower plane ascending, broad ovate, cuspidate.

Hab. Port Praslin, New Ireland, *Commerson*!

305. *S. KURZII* Baker in Journ. Bot. 1885, 249. — Stems suberect, 3–4 in. long, pale straw-coloured, stronger than in *S. chrysorhizos*, copiously pinnate, the short erecto-patent branches copiously compound. Leaves of the lower plane contiguous on the branchlets, rather spaced on the main stem, all erecto-patent, ovate-lanceolate, acute, pale green, membranous, rather more produced on the upper side of the midrib, broadly rounded, shortly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, with a large cusp. Spikes copious, short, resupinate, 1 lin. diam.; bracts very dimorphous, those of the upper plane ovate-lanceolate, erecto-patent; of the lower plane ovate, acute, ascending, strongly keeled.

Hab. Forests of Pegu, *Kurz* 3187! Midway between *glauca* and *alutacea*.

306. *S. MINIATOSPORA* Baker in Journ. Bot. 1885, 249. *Lycopodium miniatosporum* Dalzell in Hook. Kew Journ. iv. 114. — Stems very slender, erect, 3–4 in. long, copiously pinnate, the branches erecto-patent, the lower copiously compound. Leaves of the lower plane much spaced, ascending, except in the lower part of the main stem, ovate-oblong, obtuse,  $\frac{3}{4}$ –1 lin. long, bright green, membranous, very unequal-sided, cordate, serrulate, and much imbricated over the stem on the upper side at the base; leaves of the upper plane very small, ovate, cuspidate. Spikes copious, short, resupinate, above 1 lin. diam.; bracts very dimorphous, those of the upper plane crowded, lanceolate-rhomboid, bright green, the



lower subpatent; those of the lower plane ascending, suborbicular, with a large cusp.

Hab. Bombay Ghauts, Dalzell! A near ally of *S. chrysorhizos*.

307. *S. AUREOLA* Spring Mon. ii. 244. — Stems densely tufted, slender, erect, 4–6 in. long, copiously pinnate, the branches erecto-patent, the lower copiously compound. Leaves of the lower plane spaced even on the branchlets, rather ascending, ovate-oblong, obtuse,  $\frac{1}{2}$  lin. long, bright green, membranous, unequal-sided, more produced on the upper side of the midrib, not ciliated, broadly rounded on the upper side at the base, and imbricated over the stem; leaves of the upper plane very small, ovate-cuspidate. Spikes  $\frac{1}{6}$ – $\frac{1}{4}$  in. long,  $\frac{1}{2}$  lin. diam., resupinate; bracts obscurely dimorphous, those of the upper plane lanceolate-rhomboid, erecto-patent, only projecting beyond the ovate acute ascending bracts of the lower half of the spikes.

Hab. Khasia Mountains, Griffith!

308. *S. DALZELLII* Baker in Journ. Bot. 1885, 249. *Lycopodium cæspitosum* Dalz. in Hook. Kew Journ. iv. 114, non Blume. — Stems erect, tufted, slender, pale straw-coloured, 4–6 in. long, copiously pinnate, the branches erecto-patent, the lower copiously compound. Leaves of the lower plane nearly contiguous on the branchlets, spaced on the main stem, all erecto-patent, oblong-lanceolate, acute,  $\frac{1}{2}$  lin. long, bright green, membranous, nearly equal-sided, strongly ciliated, broadly rounded, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, with a large cusp. Spikes short, copious, resupinate, 1 lin. diam.; bracts very dimorphous, those of the upper plane ovate-lanceolate, erecto-patent, bright green; those of the lower plane pale, ascending, ovate-cuspidate.

Hab. Bombay Ghauts, Dalzell! With *S. miniatospora*.

309. *S. PELAGICA* Baker in Journ. Bot. 1885, 250. — Stems densely tufted, often forked from the base, very slender, erect, 3–4 in. long, pinnate, the branches ascending, the lower copiously compound. Leaves of the branchlets ascending and nearly contiguous, of the main stem spaced and spreading, oblique oblong, obtuse,  $\frac{1}{2}$ –1 lin. long, dark green, membranous, unequal-sided, broadly rounded, shortly ciliated, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblong, with a large cusp. Spikes short, copious, resupinate,  $\frac{3}{4}$  lin. diam.; bracts not very dimorphous, those of the upper plane oblique ovate-lanceolate, erecto-patent; of the lower plane ovate-cuspidate, ascending.

Hab. Fiji Islands, Seemann 705!

310. *S. GLAUCA* Spring Mon. ii. 252. — Stems slender, erect,  $\frac{1}{2}$  ft. long, simple at the base, copiously pinnate above it, the branches erecto-patent, the lower copiously compound. Leaves of the lower plane contiguous on the branchlets, spaced on the main stem, all much ascending, oblique ovate, acute,  $\frac{1}{2}$ –1 lin. long, bright green, rather firmer in texture than in its neighbours, much dilated,

obscurely ciliated, broadly rounded, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblique ovate, acute. Spikes copious, short, resupinate,  $\frac{3}{4}$  lin. diam.; bracts of the upper plane ovate, acute, dark green, erecto-patent; of the lower plane more ascending, pale green, orbicular, with a cusp.

Hab. Forests of Assam, *Mrs. Mack*!

311. *S. CHRYSORHIZOS* Spring Mon. ii. 251. — Stems densely tufted, very slender, erect, 3-4 in. long, copiously pinnate, the branches erecto-patent, the lower and middle ones considerably compound. Leaves of the lower plane spaced even on the branchlets, oblique oblong, subobtuse, rather ascending,  $\frac{1}{2}$  lin. long, membranous, bright green, more produced on the upper side of the midrib, serrulate on the upper edge, broadly rounded on the upper side at the base, and imbricated over the stem; leaves of the upper plane very small, ovate, cuspidate. Spikes short, copious, resupinate, 1 lin. diam.; bracts very dimorphous, those of the upper plane oblong-rhomboid, bright green, erecto-patent; of the lower very small, pale green, ovate, with a large cusp.

Hab. Assam, Khasia Mountains, and Tenasserim. Doubtfully distinct as a species from *S. chrysocaulos*.

312. *S. CRASSIPES* Spring Mon. ii. 243 — Stems 6-9 in. long, erect, pale yellow, a line diam. at base, copiously pinnate, the erecto-patent branches copiously compound. Leaves of the lower plane spaced even on the branchlets, the upper ascending, the lower spreading, oblique ovate, acute,  $\frac{3}{4}$ -1 lin. long, bright green, membranous, much dilated on the upper side of the midrib, very cordate, serrulate, and much imbricated over the stem on the upper side at the base; leaves of the lower plane half to a third as long, ovate, cuspidate. Spikes copious, resupinate,  $\frac{1}{4}$ - $\frac{1}{2}$  lin. long, 1 lin. diam.; bracts very dimorphous, those of the upper plane oblique ovate-lanceolate, erecto-patent; those of the lower plane pale green, orbicular, with a large cusp.

Hab. Woods of Ceylon, at about 5000 ft., *Gardner* 1274! *Col. Walker*! A near ally of the Himalayan *S. chrysocaulos*.

313. *S. CHRYSOCAULOS* Spring Mon. ii. 250. *S. subdiaphana* Spring. *S. hypnoides* Spring Mon. ii. 101. *Lycopodium chrysocaulon* Hook. & Grev. *L. subdiaphanum* Wall. — Stems densely tufted, slender, erect, bright yellow,  $\frac{1}{2}$ -1 ft. long, copiously pinnate, the short erecto-patent branches copiously compound. Leaves of the lower plane spaced even on the branchlets, more or less ascending, oblique ovate, acute,  $\frac{3}{4}$ -1 lin. long, bright green, membranous, very unequal-sided, broadly rounded, serrulate, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane a third to half as long, ovate, distinctly cuspidate. Spikes copious, short, resupinate, 1 lin. diam.; bracts very dimorphous, those of the upper plane crowded, erecto-patent ovate-lanceolate; of the lower plane shorter, paler, ascending, broad ovate, with a large cusp.

Hab. Common in the Eastern and Central Himalayas, ascending to 7000—8000 ft. in Kumaon. Moulmein, *Parish* 118! Penang, *Wallich*!

314. *S. TENUIFOLIA* Spring Mon. ii. 253.—Stems tufted, suberect, a span long, copiously pinnate, the erecto-patent branches copiously compound. Leaves of the lower plane subcontiguous and erecto-patent on the branchlets, spaced and spreading on the main stem, ovate- or oblong-rhomboid, subacute, 1-12th to 1-8th in. long, pale green, membranous, much dilated, cordate, serrulate, and imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, ovate, with a large cusp. Spikes short, copious, resupinate, 1 lin. diam.; bracts very dimorphous, those of the upper plane lanceolate-rhomboid, bright green, erecto-patent; those of the lower plane ascending, pale, broad ovate, cuspidate.

Hab. Mishmi and Khasia Mountains, *Griffith*!

315. *S. LAXA* Spring Mon. ii. 246.—Stems suberect, a span long, pinnate, the erecto-patent branches copiously compound. Leaves of the lower plane spaced even on the branchlets, ovate-oblong, subobtuse, a line long, membranous, unequal-sided, both margins denticulate, rather narrowed to a slightly emarginate base; leaves of the upper plane a third to half as long, obovate, acuminate. Spikes short, resupinate, 1 lin. diam.; bracts of the upper plane oblong-lanceolate, very acute, erecto-patent; of the lower plane ovate-cuspidate.

Hab. Tahiti, *Morrenhout*.

316. *S. TENERA* Spring Mon. ii. 241. *Lycopodium tenerum* Hook. & Grev. — Stems  $\frac{1}{2}$ –1 ft. long, erect from the base or decumbent in the lower part, not so stout as in *suberosa*, copiously pinnate, the flaccid erecto-patent branches copiously compound. Leaves of the lower plane ascending and nearly contiguous on the branchlets, much spaced and spreading, or rather squarrose on the main stem, oblong-rhomboid, subacute, 1-12th to 1-8th in long, bright green, very membranous in texture, unequal-sided, much dilated, broadly rounded, serrulate, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane very small, lanceolate-cuspidate. Spikes short, resupinate, 1 lin. diam.; bracts of the upper plane lanceolate-rhomboid or the upper ovate, erecto-patent; of the lower plane ascending, ovate-cuspidate.

Hab. Mountains of Peninsular India and Ceylon. *L. Macraei* and *calostachyon* of Hooker & Greville, the latter cited by Spring under *S. ciliaris*, both seem to be small forms of this species; and I cannot distinguish from it by any definite character *S. debile* Spring Mon. ii. 122 (*Lycopodium debile* Bory in Belang. Voy. ii. 8, tab. i, fig. 1), from Java and the Malay Peninsula, and *S. aristata* Spring Mon. ii. 245, from the Philippines, *Cuming* 1996!

317. *S. MYOSUROIDES* Spring Mon. ii. 236.—*Lycopodium myosuroides* Kaulf.—Stems ascending, a span long, copiously pinnate, the lower branches copiously compound. Leaves of the lower plane spaced, oblong-lanceolate, acute,  $\frac{1}{8}$  in. long, light green, membranous, nearly equal-sided, ciliated on the upper side at the base; leaves of the upper plane very small, cuspidate. Spikes resupinate,  $\frac{1}{2}$  in. long; bracts of the upper plane subimbricated, erecto-patent, oblique lanceolate; of the lower plane ascending, ovate-cuspidate.



Hab. Manilla, Philippine Islands, *Chamisso*. Habit like that of *S. Menziesii*.

318. *S. SUBEROSA* Spring Mon. ii. 252. — Stems densely tufted, suberect, often above a foot long, pale shining brown,  $\frac{1}{8}$  in. diam. at the base, copiously pinnate, the branches erecto-patent, and decompound, the root-fibres sometimes extending half-way up it. Leaves of the lower plane spaced and erecto-patent on the branches, very distant and spreading on the main stem, oblique lanceolate or ovate-lanceolate, acute, bright green, membranous, unequal-sided, much produced, broadly rounded, shortly ciliated, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblong, with a large cusp. Spikes copious,  $\frac{1}{4}$ – $\frac{3}{4}$  in. long,  $\frac{1}{8}$ – $\frac{1}{6}$  in. diam., resupinate; bracts of the upper plane lanceolate, erecto-patent; of the lower plane ascending, ovate, with a large cusp.

Hab. Khasia Mountains, Sikkim, Assam, Malay Peninsula.

319. *S. PERPUSILLA* Baker in Journ. Bot. 1885, 292. — Stems suberect, very slender, under an inch long, sparingly pinnate, the upper branches simple, the lower sometimes forked. Leaves of the lower plane erecto-patent and contiguous on the branchlets, spaced and spreading on the main stem, oblique oblong, acute,  $\frac{1}{2}$  lin. long, bright green, membranous, rather unequal-sided, broadly rounded, serrulate, and slightly imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate-cuspidate. Spikes very short, resupinate,  $\frac{1}{8}$ – $\frac{1}{6}$  in. diam.; bracts of the upper plane lanceolate, erecto-patent, green; of the lower plane pale, ascending, ovate-cuspidate.

Hab. Nyika County, East Tropical Africa, *Rev. T. Wakefield*!

320. *S. TENERRIMA* A. Br. in Kuhn Fil. Afric. 193. — Stems very slender, suberect, flexuose,  $1\frac{1}{2}$ –2 in. long, sometimes forked at the base, copiously pinnate, the lower branches considerably compound. Leaves of the lower plane spaced even on the branchlets, the upper erecto-patent, the lower patent, oblong-lanceolate, acute,  $\frac{1}{2}$  lin. long, pale green, membranous, rather unequal-sided, denticulate and slightly rounded on the upper side at the base, hardly at all imbricated over the stem; leaves of the upper plane half as long, oblong, with a large cusp. Spikes very short, resupinate,  $\frac{1}{8}$  in. diam.; bracts of the upper plane lanceolate, rather squarrose; of the lower plane pale, ascending, ovate-lanceolate, acuminate.

Hab. Golungo Alto, Angola, in woods by the side of streams, *Welwitsch* 45!

321. *S. SUBCORDATA* A. Br. in Kuhn Fil. Afric. 193 — Stems very slender, suberect, sometimes forked at the base,  $1\frac{1}{2}$ –2 in. long, copiously pinnate, the lower branches with several short patent branchlets. Leaves of the lower plane crowded on the branchlets, spaced and patent on the main stem, oblique ovate, acute,  $\frac{1}{2}$  lin. long, membranous but rather rigid, shortly ciliated on the upper margin, very cordate, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate-cuspidate. Spikes not seen.

Hab. Sierra Leone, on shaded rocks in the woods at Freetown, *Welwitsch* 3!

322. *S. UNILATERALIS* Spring Mon. ii. 254.—Stems 3–6 in. long, erect from a decumbent base, closely pinnate, the lower branches scarcely an inch long, but considerably compound. Leaves of the lower plane very crowded, ovate-oblong, acute, above a line long, rigid, pellucid, bright green, slightly falcate, conspicuously ciliated on the upper edge; those of the upper plane very small, sub-orbicular, cuspidate. Spikes  $\frac{1}{6}$ – $\frac{1}{4}$  in. long, resupinate; bracts of the upper plane ovate-oblong, subobtusate; of the lower plane ovate or orbicular, cuspidate.

Hab. Madagascar, *Bernier*.

222. *S. MADAGASCARIENSIS* Baker in Journ. Bot. 1885, 293.—Stems erect, pale straw-coloured,  $\frac{1}{2}$ –1 ft. long, copiously pinnate, the lower branches with numerous compound branchlets. Leaves of the lower plane spaced even on the branchlets, erecto-patent; those of the stem spreading, oblong-lanceolate, acute, pale green, membranous, a line long, very unequal-sided, broadly rounded, serrulate, and slightly imbricated over the stem on the upper side at the base; leaves of the upper plane half to a third as long, ovate-lanceolate, cuspidate. Spikes short, copious, resupinate, 1 lin. diam.; bracts of the upper plane ovate-lanceolate, erecto-patent; of the lower plane pale, ovate-cuspidate, ascending.

Hab. Madagascar, near Antananarivo, *Pool*! *Miss Helen Gilpin*! Closely allied to *S. chrysocaulos* of the Himalayas.

324. *S. MELLERI* Baker in Journ. Bot. 1885, 293.—Stems erect,  $\frac{1}{2}$  ft. long, copiously pinnate, the erecto-patent branches copiously compound. Leaves of the lower plane contiguous and erecto-patent on the branchlets, much spaced and spreading on the main stem, oblique oblong, acute, pale green, membranous,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. long, more rigid in texture than in *S. madagascariensis*, not so unequal-sided, serrulate all down the upper edge, broadly rounded, and imbricated over the stem on the upper side at the base; leaves of the upper plane small, ovate-cuspidate. Spikes short, resupinate, 1 lin. diam.; bracts of the upper plane oblong-rhomboid, obtuse, erecto-patent; of the lower plane ascending, ovate-cuspidate.

Hab. Madagascar, on mountainous paths at Inbatomanga, *Dr. Meller*! *Tanala, Kitching*!

325. *S. MOLLICEPS* Spring Mon. ii. 257. *S. rubricaulis*, A. Br. in Kuhn Fil. Afr. 211. *S. Hildebrandtii* A. Br.—Stems erect, densely tufted, 6–9 in. long, copiously pinnate, the face bisulcate, the lower branches copiously compound. Leaves of the lower plane contiguous on the branchlets, spaced on the main stem, erecto-patent, oblique oblong-lanceolate, acute, dark green, membranous, 1 lin. long, very unequal-sided, serrulate on the upper edge, broadly rounded, shortly ciliated, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane half to a third as long, ovate or ovate-lanceolate, cuspidate. Spikes copious, resupinate,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1 lin. diam.; bracts of the upper plane erecto-patent, lanceolate-rhomboid; of the lower plane ovate-cuspidate, ascending.

Hab. Upper Guinea, *Curror! Barter!* Angola, *Welwitsch!* Manganja Hills, alt. 3000 ft., *Dr. Kirk!* Madagascar, *Lyall!* Johanna Island, 1000—2500 ft., *Hildebrandt 1807!* *Dr. Meller!*

326. *S. SIMPLEX* Baker in Journ. Bot. 1885, 293. — Stems very slender, erect, simple,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long. Leaves of the lower plane spaced, spreading, broad oblong, acute,  $\frac{1}{2}$  lin. long, pale green, membranous, subentire, not ciliated, nearly equal-sided, rounded on both sides at the base, not imbricated over the stem; leaves of the upper plane minute, lanceolate-cuspidate. Spikes nearly as long as the stem, resupinate, 1 lin. diam.; bracts of the upper plane lanceolate, membranous, spreading, squarrose; of the lower plane ovate-cuspidate, ascending.

Hab. Santarem, Amazon Valley, *Spruce 947!*

327. *S. PLATYPHYLLA* Baker in Journ. Bot. 1885, 294. — Stems very slender, 2–3 in. long, ascending, with root-fibres from the lower half, distantly pinnately branched, the lower branches slightly compound. Leaves of the lower plane spaced, except towards the tip of the branchlets, oblique ovate, patent, subobtuse, a line long, bright green, membranous, rounded on both sides at the base, more so on the upper side, not ciliated; leaves of the upper plane a third as long, oblique ovate. Spikes very short, resupinate, 1-12th to 1-8th in. diam.; bracts distinctly dimorphic, those of the upper plane oblique ovate, erecto-patent; of the lower plane ovate-cuspidate, ascending.

Hab. Kaieteur Falls, Demerara, *E. F. in Thurn!* A near ally of *S. Lychnuchus*.

328. *S. AMBIGUA* A. Br. in Crypt. Nov. Gran. 370. — Stems slender, suberect, 2–3 in. long, copiously pinnate, the lower branches considerably compound, the tips often produced and whip-like. Leaves of the lower plane spaced, erecto-patent, oblique ovate, acute,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. long, pale green, membranous, broadly rounded on the upper side at the base and imbricated over the stem, serrulate, not distinctly ciliated; leaves of the upper plane half as long, ovate, shortly cuspidate. Spikes short, resupinate, 1 lin. diam.; bracts of the upper plane erecto-patent, oblique ovate, crowded; of the lower plane rather shorter, ovate-cuspidate, strongly keeled.

Hab. Venezuela, *Fendler 402!* Cumana, *Moritz 221.*

329. *S. LYCHNUCHUS* Spring Mon. ii. 247. — Stems very slender, suberect from a decumbent base, 3–4 in. long, copiously pinnate, the lower branches slightly compound. Leaves of the lower plane spaced even on the branchlets, more or less ascending, oblique ovate, acute, a line long, bright green, membranous, unequal-sided, broadly rounded, shortly ciliated, and imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblique ovate, with a large cusp. Spikes short, resupinate,  $\frac{1}{2}$  lin. diam.; bracts very dimorphous, those of the upper plane ovate-lanceolate, erecto-patent, slightly squarrose; those of the lower plane pale, ovate-cuspidate, ascending.

Hab. Guatemala and Venezuela.



330. *S. ANOMALA* Spring Mon. ii. 247. *Lycopodium anomalum* Hook. & Grev.—Stems suberect, with root-fibres from the lower part, 4–6 in. long, pinnate, the branches erecto-patent, the lower copiously compound. Leaves of the lower plane contiguous and ascending on the branches, spaced and spreading on the stem, ovate, acute, a line long, dark green, membranous, much dilated, very cordate, strongly ciliated, and much imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblique ovate, cuspidate. Spikes copious, resupinate, as broad as the leafy branches; bracts of the upper plane oblique ovate-lanceolate, erecto-patent; of the lower plane ovate-cuspidate, ascending.

Hab. Demerara, *Parker*! *Jenman* 2322! Cayenne, *Leprieur* 165! *Sagot* 749! 1123!

331. *S. LEPTOSTACHYA* A. Br. in Crypt. Nov. Gran. 373.—Stems slender, suberect, with root-fibres from the lower half, bisulcate down the face, closely pinnate, the branches erecto-patent, the lower copiously compound. Leaves of the lower plane contiguous on the branchlets, spaced on the main stem, ovate, acute, 1-12th to 1-8th in. long, bright green, firmer in texture than in *S. Lychnuchus*, nearly equal-sided, not ciliated, a little dilated, and slightly imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, oblong-cuspidate. Spikes resupinate, reaching an inch or more in length, 1-12th in. diam.; bracts of the upper plane lanceolate-acuminate, erecto-patent; of the lower plane ovate-lanceolate, ascending, strongly keeled.

Hab. New Granada, at Mujo, 2500 ft., *Lindig* 1514!

332. *S. KARSTENIANA* A. Br. in Crypt. Nov. Gran. 372.—Stems about a foot long, erect from a decumbent base, bisulcate down the face, copiously pinnate, the short erecto-patent branches sparingly compound. Leaves of the lower plane ovate, acute, dark green, subdiaphanous, very unequal-sided, denticulate on the upper margin, much produced on the upper side at the base, and imbricated over the stem; leaves of the upper plane a third as long, ovate-oblong, cuspidate. Spikes short, often geminate, but little flattened; bracts not very obviously dimorphous.

Hab. New Granada, at Puerto Cabello, *Karsten* 174.

333. *S. RAMOSISSIMA* Baker in Journ. Bot. 1885, 295.—Stems erect,  $\frac{1}{2}$  ft. long, simple near the base, copiously pinnate above it, the lower branches decompound. Leaves of the lower plane spaced even on the branchlets, ascending, oblong-lanceolate or lanceolate, acute, a line long, bright green, membranous, nearly equal-sided, serrulate on both sides, rounded, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, ovate, with a large cusp. Spikes very copious, resupinate,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, 1-12th to 1-8th in. diam.; bracts very dimorphous, those of the upper plane lanceolate, ascending, rather squarrose; those of the lower plane ovate-lanceolate, ascending.

Hab. Eastern Peru, near Tarapoto, *Spruce* 4008! A near ally of *S. molliceps*.

334. *S. STENOPHYLLA* A. Br. in Ann. Sc. Nat. 4, xiii. 83. *S. macroura* Liebm. *S. Lychnuchus* Fourn. Fil. Mex. 148, non Spring.—Stems suberect, pale straw-coloured,  $\frac{1}{2}$ –1 ft. long, acutely angled on the face, with root-fibres from the lower half, copiously pinnate, the lower branches copiously compound. Leaves of the lower plane spaced even on the branchlets, ascending, oblong-lanceolate, subobtuse, 1-12th to 1-8th in. long, unequal-sided, serrulate on the upper edge, rounded, and imbricated over the stem on the upper side at the base; leaves of the upper plane a third to half as long, oblique ovate, cuspidate. Spikes short, resupinate, 1 lin. diam.; bracts of the upper plane lanceolate, erecto-patent; of the lower plane ovate-lanceolate, ascending, serrulate.

Var. *rigidiuscula* Fourn. is a form of exposed places, with shorter more rigid leaves than in type, and nearly square spikes with indistinctly dimorphic bracts. *S. albospica* Hort. is a form of this species.

Hab. Mexico, *Bourgeau* 1654! *Hahn* 2156!

## 2. ISOETES Linn.\*

*Sporangia* comparatively large, membranous, 1-celled, uniform, indehiscent, placed in a hollow of the dilated base of the leaves, those of the outer leaves containing macrospores and usually those of the inner leaves of the same plant microspores. *Macrospores* globose, usually chalk-white, with three prominent ribs radiating from the apex to the middle, leaving the lower hemisphere, with the hilum at its base, ribless. *Microspores* very minute, dust-like, trigonous, with a single ventral rib.—Stemless perennials, aquatic or growing in damp ground, with a 2-3-lobed rootstock of firm texture, emitting dense tufts of root-fibres from its underside. *Leaves* without any lamina, forming a dense rosette, subulate, rounded on the back, with 4 vertical air-channels divided by transverse septa, always furnished with central and dorsal vascular bundles and often with others round the circumference; dilated base of the leaf membranous, a space round the sporangium (area) thicker, the sporangium often more or less covered in part by the produced epidermis of the upper surface of the leaf (veil); above the sporangium is a small transverse slit (foveole), with a small membranous process (labium, lip) produced from its lower and another (lingula, tongue) from its upper side, the horseshoe-shaped base of the latter (glossopodium) immersed in the lamina.

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\* For further information see a paper by A. Braun entitled "Zwei Deutsche Isoetes-arten," in Verhandlungen des botanischen vereins für die Provinz Brandenburg, heft 3–4 (1862), and Berlin Monatber. 1868, pp. 535 to 539; Durieu in Bull. Bot. Soc. France, vol. viii. (1861), p. 164, and vol. xi. (1864), p. 106; Engelmann in edit. v. of Gray's Flora of the Northern United States and Amer. Nat. 1874, p. 214, and Milde Fil. Eur. p. 274 to 290.

Group 1. *Aquaticæ*. Species inhabiting lakes and ponds, where they are permanently submerged. Leaves without stomata, accessory bast-bundles, or persistent bases.

Veil none . . .	Sp. 1-3
Veil partial . . .	Sp. 4-7
Veil complete . . .	Sp. 8-9

Group 2. *Subaquaticæ*. Species inhabiting shallow water. Leaves with a few stomata, but without either accessory bast-bundles or persistent bases.

Rootstock 2-lobed . . .	Sp. 10-14
Rootstock 3-lobed . . .	Sp. 15-18

Group 3. *Amphibiæ*. Species inhabiting waters where they are liable to be left dry. Leaves furnished with accessory bast-bundles and abundant stomata. A few small membranous leaf-bases occasionally persistent.

Rootstock 2-lobed . . .	Sp. 19-24
Rootstock 3-lobed . . .	Sp. 25-47

Group 4. *Terrestres*. Species growing in damp soil. Leaves furnished with accessory bast-bundles and abundant stomata. Bases of the leaves of a former year regularly persistent in the form of blackish indurated scales outside the new leaves . . . Sp. 48-49

#### Group 1.—*Aquaticæ*.

1. *I. TRIQUETRA* A. Br. in Verh. Branden. 1862, 36. *I. andina* Spruce MSS.—Rootstock very thick (nearly 1 in. diam.), 2-lobed. Leaves 60-100, stiffly erect, firm in texture, dull green, 2-3 in. long,  $\frac{1}{8}$  in. broad at the middle, with a channelled triquetrous tip, and a distinct crisped border reaching from the base half-way up, without either stomata or accessory bast-bundles. Sporangia oblong, truncate at the apex,  $\frac{1}{4}$  in. long, copiously dotted; veil none. Macrospores obscurely tubercled between the ridges, more distinctly tubercled on the lower half. Microspores smooth, brown or white.

Hab. Andes of Quito, Spruce! Peru, Lechler.

2. *I. GUNNII* A. Br. in Berl. Monatber. 1868, 535.—Rootstock 3-lobed. Leaves 50 or more, stiffly erect, opaque, dark green, 2-3 in. long, 1-12th in. broad at the middle, narrowed suddenly at the tip, with a short brown uncrisped border running up from the base, without stomata or accessory bast-bundles. Sporangia small, orbicular; veil none. Macrospores large, smooth, chalk-white. Microspores smooth.

Hab. Tasmania, forming large masses in the mountain-lakes, alt. 3500-4000 ft., Gunn, 1563!

3. *I. ELATIOR* F. M.; A. Br. in Linnæa, xxv. (1852), 722; Berl. Monat. 1868, 536. *I. tasmanica* F. M.; Durieu in Bull. Bot. Fr. 1864, 104, ex parte.—Rootstock 3-lobed. Habit of *I. lacustris*. Leaves 30-50, flaccid, dark green, diaphanous, reaching a foot in



length,  $\frac{1}{2}$  lin. broad at the middle, the lanceolate base running up the edge as a distinct membranous uncrispd border for 3-4 in., without stomata or accessory bast-bundles. Sporangia small, brown, orbicular, unspotted; veil none. Macrospores small, white, finely granular. Microspores smooth.

Hab. Tasmania, in lakes, *Archer*!

4. *I. LACUSTRIS* Linn.; Hook. Brit. Ferns, t. 55; Durieu, Bull. Bot. France, 1861, 164; A. Br. in Verh. Branden. 1862, 17. *I. atrovirens* T. Fries. *I. macrospora* Durieu. *I. Morei* D. Moore.—Rootstock 2-lobed, generally about  $\frac{1}{2}$  in. diam. Leaves generally 20-50, 3-6 in. long,  $\frac{1}{2}$ -1 lin. diam. at the middle, dark green, flaccid, diaphanous, tapering to the point, the edge decurrent from the base, short and narrow, without stomata or accessory bast-bundles. Sporangia subglobose or oblong,  $\frac{1}{6}$ - $\frac{1}{4}$  in. long, unspotted; veil partial. Macrospores large, white, strongly granulated. Microspores quite smooth.

Hab. Widely spread in the lakes of Northern and the mountains of Central Europe; rare in North America. Durieu, in Bull. Bot. Soc. France, xi. 102, separates the American plant by its larger macrospores as a species as *I. macrospora*. *I. Morei* D. Moore in Journ. Bot. 1878, 353, t. 199, from Lough Bray, Wicklow, is a large flaccid form with leaves about a foot long. *I. crassa*, *setacea*, and *tenella* of Leman and Desvaux represent three forms of this species as to robustness of growth.

5. *I. ECHINOSPORA* Durieu in Bull. Soc. Bot. France, viii. 164; A. Br. in Verh. Brand., 1862, 24; Bab. in Journ. Bot. 1863, t. 1.—Rootstock  $\frac{1}{2}$ - $\frac{3}{4}$  in. diam., 2-lobed, rarely 3-lobed. Habit of *I. lacustris*, but leaves more slender, generally 20-50, 4-6 in. long, about  $\frac{1}{2}$  lin. broad at middle, flexible, diaphanous, light green, tapering gradually to the point, the edge decurrent from the dilated base, narrow and short. Sporangia globose or oblong,  $\frac{1}{8}$  in. long, unspotted; veil short. Macrospores middle-sized, distinctly spinulose all over. Microspores slightly papillose.

Hab. The type widely spread in the lakes of Northern and Central Europe, often associated with *I. lacustris*. In *I. Braunii* Durieu (*I. ambigua* A. Br.), of North America, Greenland, and Iceland, the leaves are darker green, with a few stomata, the veil larger, the sporangia spotted, and the microspores smooth. In *I. muricata* Durieu, of New England, the leaves are longer, the unspotted sporangia half covered by the veil, and the spinules of the macrospore shorter; and in *I. Boottii* A. Br., of Boston, U.S.A., the leaves are stiffly erect, with a few stomata, and the macrospores rather smaller, with very slender spinules.

6. *I. AZORICA* Durieu; Milde Fil. Eur. 278.—Rootstock probably 2-lobed. Habit of *I. echinospora*. Leaves 2-3 in. long, under  $\frac{1}{2}$  lin. broad at the middle, light green, diaphanous, without stomata or accessory bast-bundles. Sporangia subglobose, unspotted, 1-1 $\frac{1}{4}$  lin. long; veil large, but partial. Microspores middle-sized, reticulated over both halves. Microspores granulated.

Hab. Azores, in a shallow pool in the Island of Corvo, *H. C. Watson* 349; a few specimens collected in the year 1842.

7. *I. PYGMÆA* Engelm. in Amer. Nat. 1874, 214.—Rootstock 2-lobed. Leaves 5-10,  $\frac{1}{2}$ -1 in. long, dark green, tapering rapidly to the point, without stomata or accessory bast-bundles. Sporangia

globose; veil very narrow. Macrospores middle-sized, marked with small, regular, rarely confluent papillæ. Microspores minutely papillose or nearly smooth.

Hab. California, on the eastern declivity of the Sierra Nevada, alt. 7000 ft., Bolander; discovered in 1866.

8. *I. STUARTII* A. Br. in Berl. Monatber. 1868, 539. *I. humilior* F. M.; A. Br. in Linnæa, 1852, 722, ex parte.—Rootstock 2-lobed. Habit of *I. lacustris*. Leaves 4–6 in. long, pale green, diaphanous, narrowed gradually to the point, without stomata or accessory bast-bundles. Sporangium small, globose; veil complete. Macrospores with very numerous tubercles, which are sometimes confluent.

Hab. Tasmania, in the South Esk River, C. Stuart! *I. Hookeri* A. Br. loc. cit., from the same station, seems to be another form of the same species, with stiffer dark green leaves narrowed suddenly at the tip, and macrospores with smaller distinct tubercles.

9. *I. LECHLERI* Metten. Fil. Lechler, ii. 36; A. Br. in Verh. Branden. 1862, 35.—Rootstock 2-lobed. Leaves 12–20, stouter than in *lacustris*, 3–4 in. long, 1–12th in. diam. at the middle, dark green, flexible, diaphanous, tapering gradually to an acute point, without stomata or accessory bast-bundles, the broad membranous margin decurrent from the dilated base running half-way up the lamina. Sporangium globose; veil complete. Macrospores middle-sized, smooth. Microspores minutely tubercled.

Hab. Cordilleras of Peru, Lechler, 1937! *I. socia* A. Br. l. c. 36, was afterwards regarded by him as a form of this species. *I. Karstenii* A. Br. loc. cit., gathered by Dr. Karsten at a height of 8000 ft. in the Andes of New Granada, differs only by its muricated microspores.

### Group 2.—*Subaquaticæ*.

10. *I. BOLANDERI* Engelm. in Amer. Nat. 1876, 676. *I. californica*. Engelm. MSS. olim.—Rootstock deeply 2-lobed. Habit of *I. echinospora*. Leaves 5–20, 2–4½ in. long, ⅓–½ lin. diam., tapering to a fine point, diaphanous, bright green, with stomata, but without accessory bast-bundles. Sporangium mostly oblong, unspotted, covered ⅓–¼ by the veil. Macrospores small, finely granulated. Microspores more or less papillose or spinulose.

Hab. Sierra Nevada of California, in ponds and shallow lakes, at 5000–10,000 ft., Bolander. Var. *Parryi* Engelm., from the Falls of the Yellowstone, differs by its rather smaller macrospores and almost smooth microspores.

11. *I. TUCKERMANI* A. Br.; Engelm. in Gray Man. edit. v. 676.—Rootstock 2-lobed. Habit of *I. echinospora*. Leaves 10–30, 3–4 in. long, ¼ lin. diam. at the middle, bright green, diaphanous, tapering to the point, with a few stomata, but without accessory bast-bundles. Sporangium small, globose, sometimes spotted; veil partial. Macrospores middle-sized, the upper half covered with parallel anastomosing ridges, the lower half reticulated. Microspores nearly or quite smooth.

Hab. Ponds near Boston, associated with forms of *echinospora*, *Tuckermani*!

12. I. *SACCHARATA* Engelm. in Gray Man. edit. v. 676. — Rootstock 2-lobed. Leaves 10–15, 2–3 in. long, slender, diaphanous, olive-green, furnished with stomata, but without accessory bast-bundles. Sporangium small, ovoid, nearly unspotted, only the upper edge covered by the veil. Macrospores middle-sized, minutely tubercled. Microspores papillose.

Hab. On Wicomico River, eastern shore of Maryland, between high and low tide, *Canby*.

13. I. *RIPARIA*, Engelm. in Gray Man. edit. v. 676. — Rootstock 2-lobed. Leaves 15–30, resembling those of *lacustris* in size and texture, 4–8 in. long,  $\frac{1}{3}$ – $\frac{1}{2}$  lin. diam. at the middle, deep green, diaphanous, furnished with stomata, but without accessory bast-bundles. Sporangium oblong, spotted,  $\frac{1}{8}$  in. long; veil partial. Macrospores middle-sized, white, strongly granulated all over. Microspores large, tubercled.

Hab. Gravelly banks of the Delaware, and margin of ponds in New England.

14. I. *MELANOSPORA* Engelm. in Oaks United States, ii., in note. — A dwarf gregarious, usually monoicous species, with a 2-lobed rootstock. Leaves few, slender, distichous, furnished with stomata, but without accessory bast-bundles. Sporangium small, globose; veil complete. Macrospores minute, sometimes blackish, obscurely granulated. Microspores obscurely papillose.

Hab. Georgia, on Stone Mountain, in shallow depressions at the base of granite rocks near the summit, *Canby*. Discovered in 1869.

15. I. *MUELLERI* A. Br. in Berl. Monatber. 1868, 541. — Rhizome 9-lobed. Habit of *I. echinospora*. Leaves about 3 in. long, pale green, diaphanous, narrowed to the point, furnished with stomata, but without accessory bast-bundles. Sporangium globose; veil complete. Macrospores with numerous minute unequal tubercles confluent into ridges.

Hab. Queensland, in ponds at Rockhampton, *O'Shanessey*. Discovered in 1867.

16. I. *KIRKII* A. Br. in Berl. Monatber., July 22, 1869; Kirk in Trans. New Zeal. Instit. ii. 107, t. 7. — Rootstock 3-lobed. Habit of slender forms of *I. echinospora*. Leaves 10–20, 3–4 in. long,  $\frac{1}{2}$  lin. diam. at the middle, pale bright green, diaphanous, tapering to the point, furnished with a few stomata, but without accessory bast-bundles. Sporangium small, globose; veil complete. Macrospores small, beset all over with minute unequal tubercles.

Hab. New Zealand, in lakes at a low level in the northern island, *Kirk*!

17. I. *ALPINA* Kirk in Trans. New Zeal. Instit. vii. 377, t. 25. — Rootstock 3-lobed. Habit of *I. lacustris*. Leaves 20–50, about  $\frac{1}{2}$  ft. long,  $\frac{3}{4}$ –1 lin. diam. at the middle, dark green, diaphanous, tapering to the point, furnished with a few stomata, but without accessory bast-bundles. Sporangium oblong, 1.6th to 1.5th in. long; veil complete. Macrospores middle-sized, smooth. Microspores finely tubercled.

Hab. New Zealand, in lakes of the mountains of the southern island, alt. 1700–3000 ft., *Kirk*! *Cheeseman*! *Berggren*!



18. *I. DRUMMONDII* A. Br. in Berl. Monatber. 1863, 593; 1868, 542. — Rootstock 3-lobed. Habit of European *I. tenuissima*. Leaves 6–12, scarcely diaphanous, 2–3 in. long,  $\frac{1}{4}$ – $\frac{1}{3}$  lin. diam., tapering to the point, furnished with stomata, but without accessory bast-bundles. Sporangia small, globose; veil none. Macrospores small, chalk-white, with numerous tubercles, which are distinct between the grooves, but over the basal half confluent into ridges.

Hab. Swan River, West Australia, *Drummond* 989!

### Group 3.—*Amphibia*.

19. *I. BUTLERI* Engelm. in Amer. Bot. Gaz. iii. (1878), 1. — Rootstock 2-lobed. Habit of *I. melanopoda*; said to be dioicous. Leaves 8–12, 3–7 in. long, moderately firm in texture, tapering to the point, furnished with stomata and accessory bast-bundles. Sporangia globose or oblong; veil very narrow. Macrospores larger than in *melanopoda*, marked with distinct or rarely confluent tubercles. Microspores spinulose.

Hab. Limestone gap near the watershed between the Red River and Arkansas River, Western United States, *G. D. Butler*.

20. *I. MELANOPODA* J. Gay; Durieu in Bull. Bot. Soc. France, xi. 102. — Rootstock deeply 2-lobed. Leaves 15–50,  $\frac{1}{2}$ –1 ft. long,  $\frac{1}{4}$ – $\frac{1}{3}$  lin. diam. at the middle, moderately firm in texture, opaque, tapering to the point, furnished with stomata and a few accessory bast-bundles, narrowed suddenly into the dilated base. Sporangia globose or oblong, 1-6th to 1-5th in. long, often bright chestnut-brown, copiously dotted; veil very narrow. Macrospores small, nearly or quite smooth beyond the ribs. Microspores spinulose.

Hab. Shallow ponds and damp prairies, Western United States, from Illinois to Iowa and Texas.

21. *I. ENGELMANNI* A. Br. in Flora, 1846, 178. — Rootstock deeply 2-lobed, often 1-1 $\frac{1}{2}$  in. diam. Habit of stout *I. lacustris*. Leaves 25–100, often a foot long, 1 lin. diam. at middle, diaphanous, pale green, tapering to the point, furnished with accessory bast-bundles and copious stomata, the edge decurrent from the base, short and narrow. Sporangia large, pale, oblong, unspotted; veil very narrow. Macrospores middle-sized, white, honeycombed all over. Microspores smooth or nearly so.

Hab. Ponds in the Northern United States from New England to Missouri. Var. *valida* Engelm., is a large variety, with 100–200 leaves, 1 $\frac{1}{2}$ –2 ft. long, a broader veil, both kinds of spores smaller, and microspores spinulose.

22. *I. NUTTALLII* A. Br.; Engelm. in Amer. Nat. 1874, 215. *I. opaca* Nuttall Herb. ! — Rootstock faintly 2-lobed. Leaves 20–60, 3–6 in. long,  $\frac{1}{2}$  lin. diam. at the middle, moderately firm in texture, pale green, opaque, 3-angled on the back, tapering to the point, with three accessory bast-bundles and numerous stomata, the edge decurrent from the base, short and narrow. Sporangia small, pale, oblong; veil complete. Macrospores middle-sized, densely minutely granulated. Microspores papillose.

Hab. Damp meadows and edge of ponds in Oregon. Habit of *I. melanopoda*.

23. *I. FLACCIDA* Shuttlew.; A. Br. in Flora, 1846, 178.—Rootstock 2-lobed. Habit of *I. echinospora*, but leaves much longer, 10–35, 1–2 ft. long,  $\frac{1}{2}$ – $\frac{3}{4}$  diam. at the middle, diaphanous, light green, tapering to the point, furnished with accessory bast-bundles and copious stomata, the edge decurrent from the base short and narrow. Sporangium small, pale, oblong, 1-6th to 1-5th in. long; veil complete. Macrospores small, covered with papillæ, which are confluent into ridges. Microspores slightly papillose.

Hab. Florida, in deep water. First gathered by Rugel. *I. Chapmanni* Engelm. has stouter leaves, about  $1\frac{1}{2}$  ft. long, larger macrospores, with less prominent tubercles and ridges, microspores smooth or slightly papillose.

24. *I. MARTII* A. Br.; Kuhn in Fl. Bras. i. 646, tab. 78.—Rootstock 2-lobed. Leaves numerous, very slender, flaccid, flexuose, 2 ft. long, with a ferruginous edge at the base and biseriate stomata in the upper part. Sporangium whitish; veil incomplete; tongue short, brown, cordate-triangular. Macrospores white, rugose. Microspores quite glabrous.

Hab. Brazil; Minas Geraes, in a stream at Caldas, Regnell iii. 1506, Mosen 2027.

25. *I. SETACEA* Bosc Dict. Hist. Nat.; A. Br. in Verhand. Branden, 1862, 30.—Rootstock 3-lobed, rarely 2-lobed. Leaves 10–30, often a foot long,  $\frac{1}{2}$  lin. diam. at middle, pale green, opaque, moderately firm in texture, tapering to the point, furnished with copious accessory bast-bundles and stomata, the base suddenly dilated, its decurrent edge reaching up the lamina about 2 in. Sporangium pale, globose; veil none; tongue as long as the sporangium. Macrospores large, pure white, closely finely tubercled all over. Microspores cristate.

Hab. South of France, in ponds nearly dry in summer.

26. *I. ADSPERSA* A. Br. Expl. Scient. Alg. tab. 37, fig. 3.—Rootstock 3-lobed. Habit of *I. setacea*. Leaves 12–20, 3–9 in. long,  $\frac{1}{4}$ – $\frac{1}{3}$  in. diam. at the middle, opaque, pale green, moderately firm in texture, furnished with stomata and accessory bast-bundles, the edge decurrent from the base short and narrow. Sporangium small, spotted, globose; veil very narrow; tongue twice as long as broad. Macrospores with strong ribs and a few large tubercles. Microspores prickly or crested.

Hab. Algeria and South France, in ponds dried up in summer.

27. *I. MALINVERNIANA* Cesati & De Not. Ind. Sem. Hort. Bot. Genuen. 1858, 3.—Rootstock 3-lobed, reaching an inch in diam. Habit of the large varieties of *lacustris*, but leaves much more elongated, 20–50 or more, a foot or more long,  $\frac{3}{4}$ –1 lin. diam. at the middle, diaphanous, bright green, tapering gradually to the point, furnished with stomata and accessory bast-bundles, the membranous edge decurrent from the base about 3 in. Sporangium large, pale, oblong; veil none; lip as long as the short tongue. Macrospores large, white, muricated all over. Microspores smooth.

Hab. Aqueducts in Piedmont, *Moris!* *De Notaris!*

28. *I. VELATA* A. Br. Expl. Sc. Alg. tab. 37, fig. 1. *I. decipiens* and *longissima* Bory & Durieu in Flora, 1846, 719.—Rootstock deeply 3-lobed. Habit of *I. setacea*. Leaves 20–50, reaching a foot or more in length,  $\frac{1}{3}$  lin. diam. at the middle, moderately firm in texture, pale green, opaque, tapering to the point, furnished with copious stomata and accessory bast-bundles, a distinct membranous border decurrent from the dilated base for 2–3 in. Sporangium middle-sized, subglobose; veil nearly or quite complete; lip very short; tongue lanceolate. Macrospores middle-sized, minutely tubercled between the ribs, more prominently tubercled on the lower half. Microspores spinulose.

Hab. Mediterranean region, from Spain to Asia Minor. See Dr. Franchet's remarks on this species and its allies in Bull. Soc. Bot. France, xxxi. 349.

29. *I. PERALDERIANA* Durieu & Letourn. in Kralik Pl. Alg. Exsic. 157.—Rootstock 3-lobed. Leaves 12–20,  $\frac{1}{2}$ –1 ft. long,  $\frac{1}{3}$  lin. diam. at the middle, opaque, pale green, moderately firm in texture, furnished with copious stomata and accessory bast-bundles, the membranous border towards the base less distinct than in *velata*. Sporangium pale, globose,  $\frac{1}{6}$  in. long; veil nearly or quite complete; lip truncate; tongue lanceolate. Macrospores middle-sized, minutely tubercled. Microspores densely spinulose.

Hab. Algeria, *Kralik*, 157! Very near *velata*.

30. *I. DUBIA* Gennari Comment. ii. 104.—Rootstock 3-lobed. Leaves about a dozen, very slender, 6–8 in. long,  $\frac{1}{4}$ – $\frac{1}{3}$  lin. diam. at the middle, opaque, pale green, with stomata and a few obscure accessory bast-bundles, the border decurrent from the base short and narrow. Sporangium small, pale, globose; veil complete; lip truncate; tongue short, broad ovate. Macrospores like those of *velata*. Microspores dimorphous, some spinulose, some crested.

Hab. Island of Magdalena, off Sardinia, *Gennari*. Very near *velata*.

31. *I. TEGULENSIS* Gennari Comment. ii. 106.—Rootstock 3-lobed. Leaves 10–20, very slender,  $\frac{1}{2}$ –1 ft. long,  $\frac{1}{4}$ – $\frac{1}{3}$  lin. diam. at the middle, opaque, pale green, furnished with stomata and a few weak accessory bast-bundles, the border decurrent from the base short and narrow. Sporangium small, pale, globose; veil nearly or quite complete; tongue and lip both short. Macrospores middle-sized, minutely tubercled. Microspores dimorphous, some spinulose, some crested.

Hab. Sardinia. Very near *velata*. The Spanish *I. baetica* Willk. & Lange Prodr. Fl. Hisp. i. 15, is either the same or a close ally.

32. *I. BORYANA* Durieu in Bull. Bot. Soc. France, viii. (1861), 164.—Rootstock 3-lobed. Habit stouter than in *velata*. Leaves 10–30 or more, 4–8 in. long,  $\frac{1}{2}$  lin. diam. at the middle, pale green, opaque, tapering gradually to the point, furnished with abundant stomata and accessory bast-bundles, with a broad membranous border shortly decurrent from the dilated base. Sporangium oblong or subglobose, pale; veil complete; tongue and lip both short. Macrospores middle-sized, with minute tubercles between the ribs



and larger ones over the lower half. Microspores dimorphous, some crested, some spinulose.

Hab. Marshes of the Landes, Gay! Durieu! Very near *velata*.

33. *I. TENUISSIMA* Boreau in Bull. Angers, 1850, 259. — Rootstock small, usually 3-lobed, rarely 4-lobed. Leaves 12–20, very slender, 3–4 in. long,  $\frac{1}{4}$ – $\frac{1}{3}$  lin. diam. at the middle, opaque, pale green, tapering gradually to the point, furnished with stomata and usually a few weak accessory bast-bundles, with a short broad membranous border decurrent from the dilated base. Sporangium small, pale, globose; veil complete. Macrospores middle-sized, furnished with large scattered tubercles. Microspores densely spinulose.

Hab. Marshes of Central France, Boreau! Franchet! Very near *velata*.

34. *I. OLYMPICA* A. Br. in Milde Fil. Eur. 285. — Rootstock 3-lobed. Habit of *I. tenuissima*, but leaves more numerous,  $1\frac{1}{2}$ –2 in. long, opaque, pale green, furnished with stomata, and a few weak accessory bast-bundles. Sporangium small, globose, unspotted; veil partial or nearly complete. Macrospores small, furnished with small tubercles between the ridges and stronger ones over the lower half. Microspores spinulose.

Hab. Bithynian Olympus, in swamps of the granitic plain, at 6000 ft. above sea-level, Dr. C. von Fritsch.

35. *I. WELWITSCHII* A. Br. in Kuhn Fil. Afric. 196. — Rootstock 3-lobed. Leaves 6–15, as firm in texture as in *I. Duriei*, 2–3 in. long, very slender, pale green,  $\frac{1}{4}$  lin. diam., furnished with stomata and accessory bast-bundles. Sporangium small, pale, globose; veil very narrow. Macrospores small, greyish, with small tubercles between the prominent ribs and larger ones over the lower half. Microspores granulated.

Hab. Angola, in high spongy pastures of the Province of Huilla, at 3800–5500 ft., Welwitsch, 166!

36. *I. NIGRITIANA* A. Br. in Kuhn Fil. Afric. 196. — Rootstock 3-lobed. Habit of *I. setacea*. Leaves 12–15, very slender, firm in texture, 6–8 in. long,  $\frac{1}{3}$  lin. diam. at the middle, pale green, opaque, furnished with stomata and a few weak accessory bast-bundles. Sporangium pale, globose,  $\frac{1}{8}$  in. long; veil very narrow. Macrospores small, greyish, with a single tubercle between each ridge and several over the lower hemisphere.

Hab. In the Niger Country at Nupe, Barter 1020!

37. *I. SCHWEINFURTHII* A. Br. MSS. — Rootstock 3-lobed. Habit of *I. setacea*. Leaves 12–30, about a foot long, moderately firm in texture, opaque, tapering to the point,  $\frac{1}{3}$ – $\frac{1}{2}$  lin. diam. at the middle, furnished with stomata and accessory bast-bundles. Sporangium small, globose; veil none. Macrospores small, chalk-white with high ridges and strongly honeycombed all over.

Hab. Central Africa, in the Kingdom of Djur, Schweinfurth, 1962!

38. *I. ÆQUINOCTIALIS* Welw.; A. Br. in Kuhn Fil. Afric. 195. — Rootstock 3-lobed. Habit of *I. setacea*. Leaves 6–12, very slender, a foot or more long,  $\frac{1}{3}$  lin. diam. at the middle, opaque, pale green,

firm in texture, tapering to the point, furnished with copious stomata and several accessory bast-bundles. Sporangium globose,  $\frac{1}{8}$  in. diam.; veil partial. Macrospores middle-sized, chalk-white, furnished with strong ridges and prominent tubercles. Microspores densely muricated.

Hab. Angola, in damp pastures of Pungo Andongo, alt. 2400—3800 ft., with *Drosera*, Dr. Welwitsch 50!

39. *I. NATALENSIS* Baker.—Rootstock 3-lobed. Leaves 12–16, very slender ( $\frac{1}{4}$  lin. diam.), pale green, opaque, firm in texture, 2–3 in. long, rounded on the back, channelled down the face, furnished with stomata and accessory bast-bundles. Sporangium small, globose, brownish; veil none. Macrospores white, with small tubercles between the ribs and large ones over the remainder of the surface. Microspores granulated.

Hab. Natal; Griffin's Hill, Eastcourt, Rehmann, 7296!

40. *I. JAPONICA* A. Br. in Verhand. Brand. 1862, 33.—Rootstock 3-lobed. Habit between *echinospora* and *setacea*. Leaves 12–30, 4–6 in. long,  $\frac{1}{3}$ – $\frac{1}{2}$  lin. diam. at the middle, bright green, diaphanous, tapering to the point, furnished with stomata and accessory bast-bundles, the edge decurrent from the dilated base short and narrow. Sporangium small, oblong; veil none. Macrospores deeply and regularly honeycombed. Microspores smooth, sometimes crested.

Hab. Japan, discovered by Schottmuller in 1860; regathered lately by Moseley and Dickens.

41. *I. COROMANDELINA* Linn. Suppl. 447; Trimen in Journ. Bot. 1882, 353, t. 234. *I. brachyglossa* A. Br. *I. capsularis* Griff. Ic. t. 116–118, non Roxb.—Rootstock 3-lobed. Habit stouter than in *setacea* and *velata*. Leaves 10–20, 9–15 in. long,  $\frac{1}{2}$ – $\frac{3}{4}$  lin. diam. at the middle, opaque, moderately firm in texture, tapering to the point, furnished with copious stomata and accessory bast-bundles, the membranous base suddenly dilated. Sporangium large, pale, oblong; veil none; tongue deltoid, as long as or shorter than the sporangium. Macrospores chalk-white, with strong ridges and prominent close tubercles.

Hab. Moist soil of Madras, Wight, 309! Coromandel, Koenig. Serampore, Griffith. Dambulla, Ceylon, Trimen! I follow Dr. Trimen in sinking *I. brachyglossa* as a species. Roxburgh's drawing of *capsularis* is *Vallisneria spiralis*.

42. *I. TRIPUS* A. Br. in Berl. Monatber. 1863, 559; 1888, 544. *I. phaeospora* Durieu in Bull. Bot. Soc. France (1864), 103.—Rootstock 3-lobed. Leaves 10–20, very slender, 1–1 $\frac{1}{2}$  in. long,  $\frac{1}{4}$ – $\frac{1}{3}$  lin. diam., opaque, pale green, firm in texture, furnished with stomata and accessory bast-bundles. Sporangium small, pale, globose; veil none. Macrospores small, greyish white, covered with dense minute tubercles. Microspores smooth or nearly so.

Hab. Swan River, West Australia, Drummond 990!

43. *I. SUKSDORFII* Baker.—Rootstock 3-lobed. Leaves 12–20, very slender, firm in texture, bright green, arcuate, deeply channelled down the face, 2–3 in. long, under  $\frac{1}{2}$  lin. diam.

Sporange orbicular,  $\frac{1}{8}$  in. long, and broad; veil complete; tongue deltoid. Macrospores greyish white, faintly granulated.

Hab. United States; Washington Territory; springs and damp meadows, W. Klickitat County, *Suksdorf* 836! Easily distinguished from the other North American *Amphibia* by its 3-lobed rootstock.

44. *I. AMAZONICA* A. Br. MSS.; Kuhn in Fl. Bras. i. 648, t. 79, figs. 5-6.—Rootstock 3-lobed. Leaves 10-20, 2-3 in. long,  $\frac{1}{4}$ – $\frac{1}{3}$  lin. diam. at the middle, firm in texture, furnished with stomata and accessory bast-bundles, with a membranous border about  $\frac{1}{2}$  in. long, decurrent from the dilated base. Sporangium small, white, globose, much spotted; veil rudimentary. Macrospores middle-sized, chalk-white, closely strongly tubercled.

Hab. Inundated places near Santarem, *Spruce* 1081!

45. *I. CUBANA* Engelm. MSS. — Rootstock 3-lobed. Leaves 10-50,  $\frac{1}{2}$ –1 ft. long,  $\frac{1}{2}$  lin. diam. at the middle, opaque, moderately firm in texture, furnished with stomata and accessory bast-bundles, the membranous base suddenly dilated. Sporangium small, oblong, unspotted; veil very narrow. Macrospores small, strongly tubercled. Microspores papillose.

Hab. Cuba, *C. Wright* 3912!

46. *I. GARDNERIANA* Kunze herb.; A. Br. in Verhand. Brand. 1862, 34.; Kuhn in Fl. Bras. i. 647, tab. 79, figs. 1-4.—Rootstock 3-lobed. Habit of *coromandelina*. Leaves 50 or more, about a foot long, 1 lin. diam. at the middle, slightly diaphanous, tapering to the point, furnished with copious stomata and accessory bast-bundles, with a narrow membranous border running up 2-3 in. from the dilated base. Sporangium large, oblong; veil none. Macrospores large, brown, beset with numerous round tubercles. Microspores smooth.

Hab. Marshes, Mission of Duro, Province of Goyaz, Brazil, *Gardner* 3563! Our specimens are without macrospores. A Paraguay plant, gathered by Balansa (1126), has them chalk-white and closely strongly tubercled.

47. *I. SAVATIERI* Franchet in Bull. Bot. Soc. France, xxxi. 395.—Rootstock obscurely 3-lobed. Leaves stout, very thick, rigid, sub-tetragonous and mucronate at the apex, 8 in. long when submerged, dwarfed to half an inch when exposed. Sporangium small; veil incomplete. Macrospores whitish, rugose with anastomosing ridges. Microspores brownish, nearly smooth.

Hab. Coast of Patagonia; Lake of Puerto Bono, lat. 30° S., *Savatier*.

#### Group 4.—TERRESTRES.

48. *I. DURIÆI* Bory, Comp. Rend. Acad. June, 1844; A. Br. Expl. Sc. Alg. t. 36, fig. 2. *I. tridentata* Durieu.—Rootstock deeply 3-lobed. Leaves 10-40, very slender, 2-4 in. long,  $\frac{1}{3}$  lin. diam., pale green, firm in texture, with abundant stomata and accessory bast-bundles; bases of the old leaves always short and minutely toothed. Macrospores middle-sized, conspicuously honey-combed. Microspores finely granulated.

Hab. Mediterranean region, from Portugal to Asia Minor.



49. I. *HYSTRIX* Bory, Comptes Rend. Acad. June, 1844; A. Br. Expl. Sc. Alg. t. 36, fig. 1. *I. Delalandei* Lloyd. *I. sicula* Todaro. *I. Duriæi* Hook. Brit. Ferns, t. 56, non Bory. *Cephaloceron Hystrix* Gennari. — Rootstock and leaves exactly as in *I. Duriæi*, but the old leaf-bases in the type furnished with hard spines  $\frac{1}{4}$ – $\frac{1}{2}$  in. long. Macrospores finely granulose. Microspores echinulate.

Hab. Guernsey and N.E. France to Spain and Asia Minor. Var. *subinermis* Durieu (*I. Hystrix*, forma desquamata, A. Br.; *Cephaloceron gymnocarpum* Gennari), differs by having only short points to the leaf-bases, like those of *I. Duriæi*.

## Order V.—RHIZOCARPEÆ.

*Macrosporangia* containing a single macrospore, from which a rudimentary prothallus is produced. *Microsporangia* containing numerous microspores. Macrosporangia and microsporangia contained in the same or different membranous *conceptacles*, which are single, without any outer covering, or several together contained in a dehiscent coriaceous outer conceptacle.—Habit very various. The *Salvinieæ* are fugacious floating annuals; the *Marsilieæ* perennials, growing in damp soil, with a filiform rootstock.

### Suborder 1.—SALVINIÆÆ.

*Conceptacles* usually single, always membranous and indehiscent, and containing sporangia of only one kind.

#### 1. SALVINIA (*Micheli*) Schreb.

*Conceptacles* globose, membranous, indehiscent, monoicous, seated in clusters on short branches of the floating stem, 1–2 of each cluster containing ten or more turbinate macrosporangia, each of which contains a single macrospore; several of each cluster containing very numerous globose microsporangia, which are much smaller than the macrosporangia, and each contains numerous minute microspores.—Fugacious annuals, with slender floating stems, giving off shortly-petioled or sessile fronds on the upper side and the short branches, that bear the conceptacles and much-branched feathered root-fibres downwards. *Fronds* small, simple, with a distinct midrib that runs from the base to the apex, and close erecto-patent secondary veinlets connected by a few arches. *Sporangia* of both kinds borne on a much-branched filamentous receptacle.

Fronds flat, floating, horizontal.

Fronds about three times as long as broad . . . . . Sp. 1.

Fronds ovate-oblong, or oblong, or oblong-orbicular . . . . . Sp. 2–7.

Fronds orbicular . . . . . Sp. 8–9.

Fronds suberect, with edges folded together . . . . . Sp. 10–11.

Imperfectly known species . . . . . Sp. 12–13.

1. *S. OBLONGIFOLIA* Mart. Ic. Crypt. Bras. 128, t. 75, fig. 2, and t. 76. — Fronds laxly placed, subsessile, horizontal, oblong, emarginate, cordate at the base,  $1\frac{1}{2}$ –2 in. long,  $\frac{1}{2}$  in. broad, the very numerous veinlets as close as in *S. Radula*, the upper surface with firm papillæ with bristly tips, the lower side finely pubescent. Conceptacles 10–20 together in peduncled clusters, the cells of their walls regularly hexagonal.

Hab. Amazon Valley and Central Brazil, *Martius*, *Pohl*, *St. Hilaire*.

2. *S. NATANS* Hoffm. Germ. ii. 1; Schk. Crypt. t. 173; Corda Rhizos. t. 2, figs. 1–11. *S. verticillata* Roxb. in Calc. Journ. 1845, t. 18–20; Griff. Ic. t. 123–128. *S. vulgaris* Rupr. *S. europæa* Desv. *S. Sprengelii* Corda Rhizos. 10, t. 2, figs. 12–23. *Marsilea natans* Linn. — Fronds oblong, horizontal, rounded or slightly cordate at the base,  $\frac{3}{8}$ – $\frac{1}{2}$  in. long, bright green on the upper surface, with about 20 erecto-patent veinlets on each side of the midrib, each beset with 6–8 tufts of minute bristles, the under side thinly matted like the stem with shining brown pellucid hairs. Conceptacles 4–8 in a cluster, the cells of their walls regularly hexagonal.

Hab. Warm temperate regions of the northern hemisphere of the Old World, extending from the South of France to North China and the Plains of India.

3. *S. NIGROPUNCTATA* A. Br. in Kuhn. Fil. Afric. 201. — Habit entirely of *S. natans*. Fronds oblong, shortly petioled,  $\frac{3}{8}$ – $\frac{1}{2}$  in. long, rounded or slightly cordate at the base, with 15–20 pairs of erecto-patent veinlets on each side of the midrib, marked with a row of spaced-out blackish dots, without distinct bristly points, the under surface thinly coated with adpressed brown hairs. Fruit unknown.

Hab. Niger Country, gathered by Vogel and Barter. Old Calabar, *Mann*!

4. *S. HILDEBRANDTII* Baker. — Fronds horizontal, sessile, oblong,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long,  $\frac{1}{8}$ – $\frac{1}{4}$  in. broad, obtuse, or obscurely emarginate, cordate at the base, flat, distinctly keeled, green and rough with minute concolorous stiff hairs all over the upper surface, brown with matted fibres beneath. Fruit unknown.

Hab. North Madagascar, *Hildebrandt* 3415!

5. *S. MOLLIS* Mett. in Kuhn Fil. Afric. 231. — Fronds horizontal, oblong, shortly petioled, 8–9 lines long, about  $\frac{1}{2}$  in. broad, truncate at the base, very obtuse at the apex, sublobed, densely clothed with short hairs, sparingly with a few longer ones beneath, the close veins anastomosing in several rows of areolæ between the midrib and edge. Fruit unknown.

Hab. Madagascar, *Thouars*.

6. *S. HASTATA* Desv. in Ann. Linn. Soc. Par. vi. 177. — Fronds laxly disposed, thin, spreading, flat, shortly petioled, ovate-oblong, about  $\frac{3}{4}$  in. long,  $\frac{1}{3}$ – $\frac{1}{2}$  in. broad, slightly cordate at the base, deeply emarginate at the apex, clothed with dense short grey pubescence all over the upper surface, thinly matted with brownish tomentum beneath; veins very numerous, fine, immersed, erecto-patent. Conceptacles not seen.

Hab. Eastern Madagascar, *Baron* 1569! *Humboldt* 350!

7. *S. RADULA* Baker.—Habit of *S. natans*. Fronds horizontal, distinctly petioled, round-oblong,  $\frac{1}{2}$ – $\frac{5}{8}$  in. long,  $\frac{3}{8}$  in. broad, distinctly cordate at the base, with 30–40 close veins on each side of the midrib, the whole upper surface rough with contiguous bristle-tipped papillæ, the lower side only clothed with a few minute fine adpressed hairs. Fruit unknown.

Hab. British Guiana, *Parker!* *Jenman* 1114! 2213! Para, *Spruce* 508! Rio Janeiro, *Raddi!* *Burchell* 1580! *Glaziou* 2443! Midway between *natans* and *auriculata*.

8. *S. MINIMA* Baker. — Habit of *S. natans*. Fronds orbicular, nearly sessile,  $\frac{1}{8}$  in. diam., rounded or slightly cordate at the base, with about 10 erecto-patent veinlets on each side of the midrib, each beset with 5–6 tufts of minute bristles, the under surface brownish, and matted with shining pellucid hairs. Fruit unknown.

Hab. Santa Catherina, South Brazil, *Dr. Fritz Muller* 479!

9. *S. AURICULATA* Aublet Guian. ii. 969, t. 367. *S. rotundifolia* Willd.; *Raddi* Fil. Bras. t. 1. *S. hispida* H. B. K. *S. biloba* *Raddi* Fil. Bras. 1, t. 1.—Fronds firmer in texture than in *S. natans*, orbicular, deeply cordate at the base,  $\frac{3}{4}$  in. broad, the veinlets very close, 40–50 on each side of the midrib, the upper surface covered all over with crested papillæ, which towards the centre of the leaf are lengthened out into prolonged pellucid subulate processes of empty cells, the under surface only thinly pubescent. Conceptacles 4–8 in a cluster, the walls of their cells very flexuose.

Var. *S. Olfersiana* Klotzsch.—Fronds tightly packed, sessile,  $\frac{1}{8}$  in. diam., with 20–30 veinlets on a side.

Hab. Tropical America, from Cuba to South Brazil. Var. *Olfersiana*. French Guiana, *Poiteau!* *Sagot* 745! South Brazil, *Olfers!* Paraguay, *Balansa* 1123! *S. affinis* Desv. in Ann. Linn. Soc. Par. vi. 177, probably belongs here.

10. *S. SPRUCEI* Kuhn in Fl. Bras. i. 655, tab. 81, figs. 11–13.—Fronds crowded, subsessile, orbicular-cuneate, suberect, cucullate,  $\frac{1}{4}$  in. broad, glabrous on both sides when mature; veins distinct, erecto-patent, anastomosing very little. Conceptacles not clustered.

Hab. Amazon Valley, at Solimoes-gapo, *Spruce* 1636 (mixed with a small form of *S. auriculata*).

11. *S. CUCULLATA* Roxb. Fl. Ind. edit. Clarke 547; Wall. Cat. No. 399.—Fronds sessile, so tightly packed on the stems that they are nearly or quite erect, with inflexed borders broader ( $\frac{1}{2}$ – $\frac{5}{8}$  in. broad) than long, broadly cuneate or cordate at the base, the veining laxer and more flabellate than in the other species; veinlets 10–12 on each side of the midrib, with 5–6 hexagonal cells in a row between them; papillæ of upper surface very minute and close; under surface nearly naked. Fruit not seen.

Hab. Tanks of the Plains of India. Swan River, *Drummond* 352!

12. *S. NYMPHELLULA* Desv. in Ann. Linn. Soc. Par. vi. 177. — Fronds suborbicular, cordate, rugoso-pilose above, sericeo-pilose beneath; petiole wedge-shaped.

Hab. West Africa.



13. *S. ADNATA* Desv. *loc. cit.* — Fronds sessile, adnate, broadly subcuneate, 4–5 lines long, densely fasciculato-pilose above, glabrous beneath.

Hab. Islands of East Africa.

#### EXCLUDED SPECIES.

*S. LÆVIGATA* Willd. Sp. Pl. v. 537, proves to be *Trianæa bogotensis* Karst.; Regel Gartenflora, t. 980; in *Hydrocharidaceæ*.

#### 2. AZOLLA Lam.\*

*Conceptacles* of two kinds, placed in the axils of the leaves of the same plant, both indehiscent, one larger, membranous, globose, containing numerous microspores, which are aggregated in massulæ which are furnished with a membranous cuticle, and are borne on a branched filiform receptacle; the other kind smaller, ovoid, containing a single macrospore, which is crowned by few or many float-corpuscles, and has a calyptrate cap, which is pushed off as the archegonium develops.—Fugacious floating water-plants with copiously branched stems; leaves sessile, minute, densely imbricated, deeply-lobed, each lobe furnished with a midrib only; the stems sending out from the under side into the water copious simple or feathered solitary or fascicled root-fibres.

Subgenus *EUAZOLLA* Meyen.—Macrospores crowned with 3 float-corpuscles. Massulæ of the microspores armed all round with rigid glochidiate processes. Root-fibres solitary Sp. 1–3.

Subgenus *RHIZOSPERMA* Meyen.—Macrospores crowned with numerous float-corpuscles. Massulæ of the microspores armed on one side with a few weak prickles without glochidiate tips. Root-fibres fascicled.

Leafy fronds single and crowded . . . . . Sp. 4.

Leafy fronds placed on a wide-trailing leafless stem Sp. 5.

1. *A. FILICULOIDES* Lam. Encyc. i. 343; Kuhn in Fl. Bras. i. 658, tab. 82, figs. 9–11. *A. magellanica* Willd. *A. Arbuscula* Desv.—Fronds 1–2 in. long, copiously bipinnate. Leaves green or often tinted with red-brown, the larger lobe ovate. Macrospore with 3 float-corpuscles, its cuticle furnished with large discoid tubercles with deep pits between. Massulæ of microspores furnished with copious rigid processes, without septa, with a glochidiate tip.

Hab. South America, mainly on the west side, ascending in the Andes to 16,000 ft. The Alpine forms are dwarf, with nearly orbicular leaf-lobes.

2. *A. RUBRA* R. Br. Prodr. 167.—Fronds deltoid,  $\frac{1}{2}$ –1 in. long, copiously bipinnate. Leaves of firm texture, red-brown, broad

\* See Mettenius in 'Linnaea,' xx. 259, figs. 2–3, and 'Plantæ Tinneanae,' p. 51, tab. 25; Griffith's 'Icones,' tabs. 119–123; and Strasburger's elaborate monograph, 'Ueber Azolla,' 86 pages 8vo, with 7 plates, Jena, 1873.

ovate, always very obtuse. Macrospore like that of *A. filiculoides*. Massulæ covered with copious septate glochidiate processes.

Hab. Australia and New Zealand.

3. *A. CAROLINIANA* Willd. Sp. Plant. v. 541; Kuhn in Fl. Bras. i. 659, tab. 82, figs. 1-6. *A. microphylla* Kaulf.; Mart. Ic. Crypt. t. 74-75. *A. densa* Desv. *A. mexicana* Schlecht. *A. portoricensis* Spreng. *A. bonariensis* Bertol. — Fronds not more than  $\frac{1}{2}$ -1 in. long, more deltoid and less copiously bipinnate than in *A. filiculoides*, the branching less racemose. Leaves of softer texture, generally pale green, smaller, the large lobes more rhomboid-oblong, always obtuse. Macrospore with 3 float-corpuscles, its cuticle finely granulated. Massulæ of the microspores with copious septate rigid processes, with a glochidiate tip.

Hab. Southern United States and California, through Tropical America to Buenos Ayres.

4. *A. PINNATA* R. Br. in Flind. Voy. ii. 611, t. 10.—Root-fibres fascicled and conspicuously feathered. Fronds oblong or deltoid,  $\frac{1}{2}$ -1 in. long, with numerous crowded primary branches, all simple or the longest with a few crowded branches towards the tip. Leaf-lobes firm in texture, red-brown, broad ovate. Macrospore crowned with numerous float-corpuscles, its cuticle finely granular, armed with a few clavate papillæ. Massulæ of microspores with only a few weak processes on one side.

Var. *A. africana* Desv. *A. guineensis* Schum. *A. decomposita* Zoll. *A. japonica* Franch. & Savat. *Salvinia imbricata* Roxb.—Fronds smaller, deltoid, with fewer more distant, more compound branches.

Hab. The type in Australia; the variety, which approximates in habit towards *A. caroliniana*, widely spread in Tropical Asia and Africa.

5. *A. NILOTICA* Decaisne; Metten. in Plant. Tinn. 51, t. 25.—Decomposed deltoid leafy fronds placed on a branched wide-trailing leafless stem, with dense fascicles of root-fibres from its nodes. Leaf-lobes ovate, often acute, conspicuously pilose. Macrospore crowned with many float-corpuscles, its cuticle finely granulated and beset with a few clavate papillæ. Massulæ like those of *A. pinnata*, but only two, not many, in a microsporangium.

### Suborder 2.—MARSILIEÆ.

*Conceptacles* always double, the outer coriaceous and dehiscent, the inner membranous and indehiscent, containing sporangia of both kinds.

### 3. MARSILEA Linn.\*

*Conceptacles* oblong or globose, coriaceous in texture, placed in the axils of the leaves or rarely on their petiole, dehiscing finally along the ventral suture into two valves and emitting a mucilaginous

\* See A. Braun's monographs as cited under the genus *Pilularia*, and a later paper in the Berlin 'Monatsbericht' for 1872, pp. 668-679, reprinted in Journ. Bot. 1873, p. 55.

placental cord, upon which are spaced out numerous oblong-cylindrical sori with a membranous coat, each sorus containing numerous microsporangia holding numerous microspores, and few macrosporangia holding solitary macrospores. — Aquatic or subaquatic, with a slender wide-creeping rhizome, the leaves produced singly or in tufts from its nodes, each consisting of a petiole and four sessile equal spreading deltoid-cuneate or oblanceolate leaflets with flabellate anastomosing veins.

- Pedicels many, short, springing from the petiole one above another . . . . . Sp. 1.  
 Pedicels 2-4-nate, rarely solitary, adnate to the base of the petioles . . . . . Sp. 2-5.  
 Pedicels 2-6-nate, rarely solitary, slightly connate at the base, quite free from the petiole . . . . Sp. 6-9.  
 Pedicels single.  
   Pedicels very short.  
     Leaflets oblanceolate . . . . . Sp. 10, 11.  
     Leaflets deltoid . . . . . Sp. 12-21.  
 Pedicels at least as long as the conceptacle.  
   Leaflets without pellucid streaks. Conceptacles mostly horizontal, adnate to the tip of the pedicel . . . . . Sp. 22-36.  
   Leaflets with pellucid streaks. Conceptacles mostly erect, not adnate to the tip of the pedicel . . . . . Sp. 37-40.

1. *M. POLYCARPA* Hook. & Grev. Ic. Fil. t. 160. *M. brasiliensis* Mart. Ic. Crypt. 122, t. 73. — Large, aquatic, glabrous, wide-creeping. Petiole  $\frac{1}{2}$ –1 ft.; leaflets thin, deltoid,  $\frac{1}{2}$ –1 in. long and broad; outer border rounded and entire. Conceptacles 10–20, placed on short curved pedicels arising from the petiole one above another some distance from its base, nearly globose, 1–12th in. long, not compressed, glabrescent, without border or basal teeth, its veins anastomosing midway between the sutures. Sori about 10.

Hab. Tropical America and Society Islands. Var. *mexicana* A. Br. is a form with fewer conceptacles, beginning lower down on the petiole; *M. picta* Feé a variety with the leaves marked with conspicuous brown streaks in the areolæ formed by the veinlets; and *M. subangulata* A. Br., a small variety with fewer rather angular tomentose conceptacles. *M. Stratiotes* A. Br., gathered by Spruce on the Lower Amazon, is perhaps a robust variety of *polycarpa* with an unusually stout rhizome and petiole, but the fruit is entirely unknown.

2. *M. QUADRIFOLIATA* Linn. Sp. 1563; Schk. Crypt. t. 173. — Large, aquatic, wide-creeping. Petiole 3–6 in.; leaflets deltoid, glabrous,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long; outer edge rounded and entire. Pedicels 2–4-nate,  $\frac{1}{2}$ –1 in. long, erect, connate with each other, and adnate to the base of the petiole and upper part of the base of the conceptacle. Conceptacles round-oblong,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, usually glabrescent when mature, not bordered; basal teeth minute. Sori 16–20.

Hab. Central Europe to Japan and the North of India. Rare in the United States (New England).



3. *M. BROWNII* A. Br. in Berl. Monat. 1863, 418. *M. quadrifolia* R. Br. Prodr. 167. — Aquatic, wide-creeping, glabrous, with habit of *M. quadrifoliata*. Petiole reaching 6–9 in.; leaflets deltoid,  $\frac{1}{2}$ – $1\frac{1}{4}$  in. long and broad; outer edge rounded, entire. Pedicels 1–3-nate, usually erect,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, shortly connate, obscurely adnate to the base of the petiole, adnate to the upper part of the base of the horizontal or deflexed tomentose or glabrescent globose-oblong conceptacle, which is  $\frac{1}{6}$  in. long, without basal teeth. Sori about 15.

Hab. New South Wales, *R. Brown!* *R. Cunningham!*

4. *M. MACROPUS* Engelm. Sillim. Journ. ser. 2, iii. 56. — Large-sized, wide-trailing, with habit of *M. quadrifoliata*. Petioles reach 6–8 in.; leaflets deltoid,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long and broad, slightly silky; outer edge rounded, entire. Pedicels 2–4-nate, erect, 3–4 times as long as the conceptacles, connate one-fourth to one-third of their length, and adnate to the base of the petiole and conceptacle. Conceptacle oblong, obliquely ascending, tomentose, 1–5th in. long; basal teeth small. Sori about 20.

Hab. Texas, *Lindheimer* iii. 573!

5. *M. DEFLEXA* A. Br. in Berl. Monatber. 1863, 421; Kuhn in Fl. Bras. i. 652, tab. 80, figs. 6–8. *M. striata* Mett. in Crypt. Nov. Gran. 394. — Aquatic, glabrous, wide-creeping. Petiole 6–8 in. long; leaflets deltoid, about  $\frac{1}{2}$  in. long and broad; outer edge rounded and entire. Pedicels 2-nate,  $\frac{1}{4}$  in. long, not connate, inserted on the petiole above its base, ascending or deflexed, inserted into the middle of the base of the obliquely-placed conceptacle, which is oblong, unbordered, 1–5th in. long, without basal teeth. Sori about 15.

Hab. Brazil, in marshes south of Oeiras, *Gardener* 2760! *M. striata* Mett., found by Triana in New Granada, has brown lines in the centre of the areolæ of its leaves, like those of *M. polycarpa* var. *picta*.

6. *M. MINUTA* Linn. Mant. 308. *M. erosa* Willd. Sp. v. 540. *M. dentata* Roxb. — Subterrestrial or aquatic, both with a wide-creeping rhizome, the latter not distinguishable, when sterile, from *M. quadrifoliata*, the former with petioles 1–2 in. long, and nearly or quite glabrous leaflets  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, conspicuously toothed on the outer edge. Pedicels 2–6-nate, stiffly erect,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, obscurely connate at the base, adnate to the whole base of the conceptacle. Conceptacle horizontal, glabrescent, about as broad as long ( $\frac{1}{8}$ – $\frac{1}{6}$  in.), truncate at the base, rounded at the apex, distinctly bordered; basal teeth both distinct, the upper one the largest. Sori 10–12.

Hab. Plains of India. Var. *Zollingeri* A. Br., from Java, differs by its subentire leaflets, tomentose mature conceptacle, and less distinct teeth. *M. crenata* Presl. Rel. Hænk. tab. 12, fig. 3, from the Philippine Islands, is perhaps the same form. A plant found by C. Wright in the Loo-Choo group is like it, but all the pedicels are solitary. *M. brachycarpa* A. Br. in Berl. Monat. 1863, 420, is a form gathered in Pegu by McClelland, with small strongly-toothed leaflets of firm texture, 1–12th to 1–8th in. long on  $\frac{1}{4}$ – $\frac{1}{2}$  petioles, and smaller conceptacles with about 6 sori. Var. *Wightii* Baker (*M. ægyptiaca* Wall. Cat. 7096, non Willd.) connects it with the type. *M. brachypus* A. Br. in Berl. Monat. 1863, 421, gathered in the Neilgherries by Dr. Wight, is a variety with

silky leaves, and 2—3-nate tomentose conceptacles on short pedicels. *M. gracilentia* A. Br. *loc. cit.*, from the Comcan, is a form intermediate between *brachypus* and the type, with longer pedicels than in the former, and less silky leaves.

7. *M. CRENULATA* Desv. Prodr. 177. *M. vulgaris* Bory, ex parte. *M. microcarpa* A. Br. *M. crenata* A. Br., ex parte.—Subterrestrial or aquatic, with a wide-creeping rhizome, the latter, when sterile, not distinguishable from *M. quadrifoliata*, the former with petioles 1–4 in., and deltoid leaflets  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, distinctly crenate on the outer edge. Pedicels 2–4-nate, stiffly erect,  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, connate at the base, free from the petiole, adnate to the whole base of the conceptacle. Conceptacle oblong-quadrate, horizontal, 1–12th to 1–8th in. long, glabrous or slightly silky, unbordered; basal teeth small. Sori about 10.

Hab. Mauritius and Bourbon. Only differs from *M. diffusa* by its distinctly crenate leaflets, and the smaller teeth of the base of the conceptacle.

8. *M. DIFFUSA* Leprieur; A. Br. in Flora, 1839, 300. *M. vulgaris* Bory, ex parte.—Subterrestrial or aquatic, both with a wide-creeping rhizome, the latter, when sterile, indistinguishable from *M. quadrifoliata*, the former with petioles 2–4 in. long and glabrous deltoid leaflets about  $\frac{1}{2}$  in. long and broad, entire or obscurely crenulate round the outer edge. Pedicels 2–4-nate, stiffly erect,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, free from the petiole, obscurely connate at the base, adnate to the whole base of the conceptacle. Conceptacle oblong-quadrate,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, horizontal, glabrescent, unbordered; basal teeth both distinct. Sori 10–12.

Hab. Algeria, Canaries, Mascaren Isles, and spread throughout Tropical Africa. Very near *M. minuta*, from which it differs by its unbordered conceptacles and usually entire leaflets. *M. cornuta* A. Br. in Berl. Monatber. 1870, 728, gathered by Welwitsch in Angola, is a form with short pedicels and petioles, crenulate leaflets, and the teeth of the base of the conceptacle very distinct, the top one hooked.

9. *M. SENEGALENSIS* A. Br. in Flora, 1839, 300. — Middle-sized, wide-trailing, subterrestrial. Petiole 1–2 in.; leaflets deltoid, slightly silky,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, distinctly crenate round the outer edge. Pedicels 2-nate, stiffly erect,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, obscurely connate at the base, free from the petiole, adnate to the whole base of the conceptacle. Conceptacle nearly square, horizontal, silky, unbordered, 1–12th in. long, persistently silky; basal teeth minute. Sori 8–10.

Hab. Senegal. Intermediate between *M. diffusa* and *ægyptiaca*.

10. *M. ANGUSTIFOLIA* R. Br. Prodr. Austr. 167.—Aquatic, large or middle-sized. Petiole reaching 1 ft.; leaflets oblanceolate, obtuse,  $\frac{1}{2}$ –1 $\frac{1}{4}$  in. long,  $\frac{1}{8}$ – $\frac{1}{3}$  in. broad, obscurely crenate on the outer edge, glabrous. Pedicels solitary, erect, very short, adnate to the upper part of the base of the conceptacle. Conceptacle oblong, horizontal,  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, unbordered, persistently tomentose; basal teeth obscure. Sori about 20.

Hab. North Australia.

11. *M. TENUIFOLIA* Engelm.; A. Br. in Berl. Monatber. 1863, 425.—Middle-sized, nearly or quite glabrous, with a slender wide-creeping rhizome. Petiole 3–4 in.; leaflets oblanceolate, about

$\frac{1}{2}$  in. long, 1-12th in. broad, with a rounded entire outer edge. Pedicels short, solitary, erect, adnate to the upper part of the base of the conceptacle. Conceptacle oblong, horizontal, unbordered, 1-5th in. long, persistently tomentose; basal teeth distinct. Sori about 20.

Hab. Texas. *Lindheimer*, fasc. iv. No. 745. *M. minuta* Fourn. in Bull. Soc. Bot. France, 1880, p. 329, gathered in Mexico by Schaffner, is said to be closely allied to this species.

12. *M. PUBESCENS* Tenore Prodr. Fl. Neap. Suppl. i. 70; A. Br. in Expl. Sc. Alger. t. 38. *M. Fabri* Dunal in Ann. Sc. Nat. ser. 2, ix. 115, t. 13.—Middle-sized, subterrestrial or aquatic, the latter short-creeping, with copious silky buds in the axils of the leaves. Petiole 1 in. to 1 ft.; leaflets deltoid, usually thinly silky,  $\frac{1}{6}$ – $\frac{1}{2}$  in. long; outer edge rather rounded, entire. Conceptacles sessile, crowded in two regular imbricating rows on the rhizome, globose-obovoid,  $\frac{1}{8}$  in. long, silky, unbordered, horizontal, with the pedicel adnate to the upper part of its base; basal teeth obscure. Sori about 10.

Hab. Mediterranean region; South France, Italy, Morocco, Algeria.

13. *M. STRIGOSA* Willd. Sp. v. 539.—Middle-sized, subterrestrial or aquatic, the former tufted, the latter short-creeping. Petiole 1–3 in.; leaflets deltoid, obscurely silky or glabrescent,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long; outer edge slightly rounded, entire. Conceptacles sessile, crowded, oblong,  $\frac{1}{6}$  in. long, with the pedicel adnate to the upper part of the base, slightly silky when mature, not bordered, not arranged on the rhizome in two regular imbricating rows; basal teeth obscure. Sori 8–10.

Hab. S.E. European Russia and Western Siberia. Very near *M. pubescens*, with which Milde unites it.

14. *M. FIMBRIATA* Thoun. & Schum. Besk. Guin. 461. — Habit of *M. quadrifoliata*. Petiole  $\frac{1}{2}$ –1 ft.; leaflets deltoid, about an inch long, glabrous above, strigillose beneath; outer edge entire. Conceptacle globose, size of anise-seed, solitary, subsessile, persistently tomentose.

Hab. Guinea, *Thouning*. Known to me only from an incomplete description.

15. *M. NUBICA* A. Br. in Berl. Monatber. 1863, 432. — Middle-sized, subterrestrial, short-creeping, glabrous. Petiole 1–1 $\frac{1}{2}$  in. long; leaflets deltoid,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long and broad; outer edge rounded, entire. Pedicels solitary, erect, very short, adnate to the base of the conceptacle, finally turning black. Conceptacle nearly square, horizontal, 1-12th in. diam., unbordered, bright black, with a loose outer skin; basal teeth obsolete. Sori about 8.

Hab. Kordofan, *Kotschy* 126! This and *M. gymnocarpa* differ from all the other species by their glossy black conceptacles with a loose wrinkled epidermis.

16. *M. HIRSUTA* R. Br. Prodr. Austral. 167. — Large or middle-sized, aquatic or subterrestrial. Petiole 1–4 in. long, in the subterrestrial form; leaflets  $\frac{1}{6}$ – $\frac{1}{2}$  in. long, silky; outer border rounded and entire. Pedicels solitary, very short, erect, adnate to the upper part of the base of the conceptacle. Conceptacle



horizontal, obliquely round-oblong, the dorsal suture nearly straight, 1-6th to 1-5th in. long, persistently tomentose, unbordered; basal teeth obscure. Sori about 15.

Hab. North Australia, Queensland, and N. S. Wales. *M. exarata* A. Br. in Berl. Monatber. 1870, 782, is a wide-trailing terrestrial form, with leaves and fruits in dense tufts at the distant nodes, and small silky leaflets of firm texture.

17. *M. VILLOSA* Kaulf. Enum. Fil. 272.—Middle-sized or large, subterrestrial or aquatic, with deltoid leaflets, with rounded entire outer border, thinly silky, except in the aquatic. Pedicel short, solitary, erect, adnate to the upper part of the base of the conceptacle. Conceptacle round-oblong, persistently silky, unbordered, about 1-5th in. long, one-fifth longer than broad; basal teeth prominent, the upper one hooked, the two separated by a narrow acute sinus. Sori about 15.

Hab. Sandwich Islands. Very near *M. vestita*.

18. *M. VESTITA* Hook. & Grev. Ic. Fil. t. 159. — Subterrestrial, tufted or wide-creeping. Petiole 1-6 in. long; leaflets deltoid,  $\frac{1}{8}$ – $\frac{1}{2}$  in. long, thinly clothed with adpressed brown hairs; outer edge rounded and entire. Pedicels short, solitary, erect, adnate to the upper part of the base of the conceptacle. Conceptacles horizontal, round-oblong, persistently tomentose, unbordered, 1-6th to 1-5th in. long; basal teeth prominent. Sori about 15.

Var. *M. mucronata* A. Br. in Sillim. Journ. ser. 2, iii. 55.—Leaflets and conceptacles less silky. Pedicels short. *M. brevipes* Nutt.

Var. *M. uncinata* A. Br. in Flora, 1839, 300.—More robust. Pedicel often longer than the conceptacle, of which the basal teeth are very distinct, the upper one hooked. Sori 20–24.

Hab. British Columbia, California and Western United States down to Texas, New Mexico, and Mexico.

19. *M. MEXICANA* A. Br. in Berl. Monatber. 1870, 747.—Middle-sized, subterrestrial, with leaves and pedicels clustered at the contiguous nodes. Petiole 1-4 in.; leaflets deltoid, slightly silky,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long; outer edge entire, a little rounded. Pedicels very short, ascending or deflexed, adnate to the upper part of the base of the conceptacle. Conceptacle round-oblong, horizontal,  $\frac{1}{6}$  in. long, persistently tomentose, unbordered; basal teeth none or very obscure. Sori 16–18.

Hab. In Mexico, near Talisco, *Beechey*! San Luis Potosi, *Parry & Palmer* 1010!

20. *M. ERNESTI* A. Br. in Berl. Monatber. 1870, 746. *M. striata* Ernst, non Mett. — Aquatic or subterrestrial, middle-sized, with crowded or widely separated nodes. Petiole  $\frac{1}{6}$  in.; leaflets deltoid, glabrous or obscurely silky, 1-12th to  $\frac{1}{2}$  in. long and broad; outer edge rounded, entire. Pedicels solitary, very short, erect or deflexed, adnate to the upper part of the base of the conceptacle. Conceptacle horizontal round-oblong, 1-5th in. long, persistently tomentose; basal teeth none, or very obscure. Sori 15–20.

Hab. Caracas, *Ernst*!

21. *M. CONCINNA* Baker. — Subaquatic, wide-trailing, small or middle-sized. Petiole  $\frac{3}{4}$ – $1\frac{1}{2}$  in. ; leaflets deltoid, glabrous or slightly silky,  $\frac{1}{8}$ – $\frac{1}{3}$  in. long and broad ; outer edge rounded, entire. Pedicels solitary, erect,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, inserted in the middle of the base of the conceptacle. Conceptacle oblong, horizontal,  $\frac{1}{8}$  in. long, persistently tomentose, unbordered, without basal teeth. Sori about 10.

Hab. Paraguay, in marshes near Assumption, *Balsana* 1127 !

22. *M. BURCHELLII* A. Br. in Berl. Monatber. 1863, 429. *M. pumila* E. Meyer. *M. pusilla* A. Br. *M. minuta* and *filiformis* Burch. — Subterrestrial or aquatic, wide-trailing, the former (*M. minuta* Burch.) with petioles  $\frac{1}{2}$ –1 in., and silky deltoid leaflets 1-12th in. long, of firm texture, entire or emarginate on the outer edge ; the latter (*M. filiformis* Burch.) with petioles 3-4 in. long, and entire glabrous leaflets  $\frac{1}{4}$ – $\frac{1}{3}$  in. long and broad. Pedicels solitary, stiffly erect,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, adnate to nearly the whole of the base of the conceptacle. Conceptacle horizontal, nearly square, 1-12th in. diam., persistently tomentose, unbordered ; upper basal tooth distinct ; lower obsolete.

Hab. Cape Colony, as far north as the Transvaal.

23. *M. BILOBA* Willd. Sp. Plant. v. 540. *M. glomerata* Presl. — Subterrestrial or aquatic, wide-trailing, the former minute, with petioles  $\frac{1}{2}$ –1 in. and silky leaflets  $\frac{1}{8}$ – $\frac{1}{6}$  in. long ; the latter with glabrous leaflets  $\frac{1}{2}$  in. long and broad ; the leaflets in both states deltoid, with a deeply-lobed outer edge. Pedicels solitary, erect, about as long as the conceptacle, adnate to its base. Conceptacle nearly square, horizontal, 1-12th in. long, persistently silky ; upper basal tooth distinct, lower obscure. Sori 8-10.

Hab. Cape Colony.

24. *M. CAPENSIS* A. Br. in Berl. Monatber. 1863, 428. — Middle-sized, aquatic or subterrestrial. Petioles reach  $\frac{1}{2}$  ft. long ; leaflets deltoid, thinly silky or glabrous,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long ; outer edge entire or emarginate. Pedicels solitary, erect,  $\frac{1}{8}$ – $\frac{1}{6}$  in. long, adnate to the base of the conceptacle. Conceptacle nearly square, horizontal, tomentose or glabrescent, unbordered, 1-12th to 1-8th in. long ; upper basal tooth distinct, lower nearly or quite obsolete. Sori 10-12.

Hab. Cape Colony. *M. villosa* Burchell MSS., of which the fruit is unknown, differs by its densely silky leaves, and nodes furnished with large buds densely coated with ferruginous shining subulate paleae.

25. *M. MACROCARPA* Presl. in Abh. Bohn. Ges. Wiss. iii. 580. *M. Dregeana* A. Br. in Berl. Monatber. 1863, 428. — Large wide-trailing, aquatic, glabrous. Petiole  $\frac{1}{2}$ –1 ft. ; leaflets deltoid,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long and broad ; outer edge entire or crenate. Pedicels solitary, erect,  $\frac{1}{2}$ –1 in. long, adnate to nearly the whole base of the conceptacle. Conceptacle horizontal, oblong-quadrate, persistently tomentose,  $\frac{1}{4}$  in. long, unbordered ; basal teeth obsolete. Sori about 20.

Hab. Cape Colony and Natal.

26. *M. ROTUNDATA* A. Br. in Kuhn. Fil. Afric. 200. — Aquatic, glabrous, moderately wide-creeping. Petiole reaching  $\frac{1}{2}$  ft. ; leaflets

deltoid,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long; outer edge rounded and entire. Pedicels solitary, erect or spreading, about  $\frac{1}{2}$  in. long, adnate to the base of the conceptacle. Conceptacle round-oblong, horizontal or obliquely ascending,  $\frac{1}{6}$  in. long, unbordered, glabrescent or slightly silky; basal teeth very obscure. Sori about 15.

Hab. Angola, in the subtemperate region of the province of Huilla, *Welwitsch* 171! Very near the Cape *M. macrocarpa*.

27. *M. SUBTERRANEA* Leprieur; A. Br. in. Flora, 1839, 301.—Habit of *M. quadrifoliata*; leaflets large, with a rounded entire outer edge. Pedicel solitary, deflexed, 2–3 times as long as the conceptacle, adnate to its base. Conceptacle forming an obtuse angle with the pedicel, round-oblong,  $\frac{1}{3}$  in. long, compressed, distinctly bordered; basal teeth close, minute. Sori about 10.

Hab. Senegal, *Perottet* 996.

28. *M. GIBBA* A. Br. in Berl. Monat. 1870, 741.—Aquatic, wide-trailing, glabrous, undistinguishable when sterile from *M. quadrifoliata*. Petiole 4–6 in. long; leaflets deltoid,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, with a tubercled epidermis; outer edge rounded, entire. Pedicels solitary, arcuate from a decumbent base, 4–5 times as long as the conceptacle, adnate to its base. Conceptacle oblong, unbordered, oblique, ascending or deflexed, 1-6th to 1-5th in. long; upper tooth distinct, lower obscure. Sori about 15.

Hab. Central Africa, in Bongo-land, *Schweinfurth* 2147!

29. *M. GYMNOCARPA* Leprieur; A. Br. in Flora, 1839, 300. *M. leiocarpa* Bory MSS.—Habit of *M. nubica*. Leaflets narrowly deltoid, nearly glabrous; outer edge rounded, entire. Pedicels solitary, erect, brownish, rather longer than the conceptacle, adnate to its base. Conceptacle nearly square,  $\frac{1}{8}$  in. diam., much compressed, unbordered, glabrous, bright black, with a loose outer skin, placed rather obliquely (declinate) as regards the pedicel; basal teeth obscure. Sori 8–10.

Hab. Senegal, *Leprieur*, *Perottet*. Differs mainly from *M. nubica* by its longer pedicel.

30. *M. ÆGYPTIACA* Willd. Sp. v. 540; Delile, Fl. Egypt. 253, t. 50.—Subterrestrial or aquatic, very variable in size. Petiole in the aquatic form  $\frac{1}{2}$ –1 ft.; leaflets deltoid,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, entire: in the subterrestrial form much shorter; leaflets  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, often thinly silky, deeply crenate on the outer edge. Pedicels solitary, erect,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, adnate to the whole base of the conceptacle, which is horizontal, nearly square, 1-12th to 1-10th in. long, usually silky, not bordered, with the upper corner of the base produced into an obscure tooth. Sori about 6.

Hab. Lower Egypt and Astracan.

31. *M. CONDENSATA* Baker.—Subterrestrial, middle-sized, densely tufted. Petioles  $\frac{1}{2}$ –1  $\frac{1}{2}$  in. long; leaflets deltoid, firm in texture, thinly silky,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, crenate on the outer edge. Pedicels in a tuft with the leaves, free to the base,  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, stiffly erect, adnate to the whole base of the conceptacle. Conceptacle horizontal,



suborbicular, densely silky, unbordered,  $\frac{1}{8}$  in. long; basal teeth none or very obscure. Sori about 10.

Hab. Scinde, *Herb. Dalzell*!

32. *M. QUADRATA* A. Br. in Berl. Monatber. 1870, 745.—Small, terrestrial, densely tufted. Petiole 1–2 in. long; leaflets deltoid, rather silky,  $\frac{1}{8}$ – $\frac{1}{3}$  in. long, crenate on the slightly rounded outer edge. Pedicels solitary, erect,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, adnate to the whole base of the conceptacle. Conceptacle nearly square, glabrescent, horizontal, unbordered, 1–12th in. long; basal teeth distinct. Sori 5–6.

Hab. Borneo, *Low*! Very near *M. ægyptiaca*.

33. *M. DRUMMONDII* A. Br. in Linnæa, xxv. 721, *M. macropus* Hook. Ic. t. 909; Gard. Ferns, t. 63. *M. Howittiana*, *sericea*, *Nardu*, *macra*, *oxaloides*, and *hirsutissima* A. Br. in Berl. Monatber. 1870, 734–739.—Large, subterrestrial or aquatic. Petiole often  $\frac{1}{2}$  ft. or more long in subterrestrial forms; leaflets deltoid, usually silky,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long; outer edge rounded, entire or crenate. Pedicels 1–2 in. long, stiffly erect, adnate to the upper part of the base of the conceptacle. Conceptacles oblique oblong, not bordered, with the dorsal suture nearly straight,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, obliquely ascending, cuspidate, with a pair of small teeth at the upper corner of the base. Sori 15–20.

Var. *M. Muellerei* A. Br. in Linnæa, xxv. 721. *M. salvatrix* Hanstein.—Conceptacle more regularly oblong, the dorsal suture more rounded.

Var. *M. elata* A. Br. in Ind. Sem. Hort. Berol. 1867, App. 3.—Conceptacle erect, with a pedicel  $2\frac{1}{2}$ –3 in. long.

Hab. Central and Southern Australia.

34. *M. BERTEROI* A. Br. in Berl. Monatber. 1870, 747. — Very near *M. mexicana*. Leaflets smaller and glabrous. Pedicels longer, curved, decumbent, sometimes twice as long as the conceptacle, adnate to the upper part of its base. Conceptacle oblong, persistently tomentose, 1–5th in. long; basal teeth obscure. Sori about 23.

Hab. St. Domingo, gathered by Bertero.

35. *M. MUTICA* Mett. in Ann. Sc. Nat. Ser. 4, xv. 88.—Aquatic, middle-sized, wide-creeping. Petiole 6–8 in. long; leaflets deltoid, glabrous  $\frac{1}{2}$  in. long; outer edge rounded, entire. Pedicels solitary, ascending,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, scarcely at all adnate to the base of the conceptacle, inserted at its lower corner. Conceptacle horizontal, unbordered, glabrescent,  $\frac{1}{8}$ – $\frac{1}{3}$  in. long, obovoid-oblong; basal teeth obsolete. Sori about 15.

Hab. New Caledonia, *Vicillard* 1698! We have aquatic forms of similar habit, but without fruit, from Tahiti and Fiji, and another from New Caledonia, with entire leaflets  $1\frac{1}{4}$ – $1\frac{1}{2}$  in. long and broad.

36. *M. ANCYLOPODA* A. Br. in Berl. Monatber. 1863, 434.—Wide-trailing, middle-sized or large, aquatic or subterrestrial, the latter with leaves rather silky. Petiole 1–4 in.; leaflets deltoid, reaching  $\frac{1}{2}$ – $\frac{3}{4}$  in. long and broad; outer border rounded and entire.

Pedicels solitary, abruptly deflexed, 1-6th to 1-5th in. long, adnate to the middle of the base of the conceptacle. Conceptacle obovoid-globose, unbordered, tomentose, 1-5th in. long; basal teeth none or very indistinct. Sori about 20.

Hab. Marshes in Ecuador, near Guayaquil, *Jameson* 394! *Spruce* 6550!

37. *M. COROMANDELICA* Burm. Fl. Ind. tab. 62, fig. 3. *M. coromandeliana* Willd. Sp. Plant. v. 539. *M. minuta* var. *coromandeliana* Linn. Mant. 308. — Small, aquatic or subterrestrial, glabrous in all its parts. Petiole  $\frac{1}{2}$ -3 in. long; leaflets deltoid, 1-12th to 1-3rd in. long; outer edge rounded, entire. Pedicels  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, free, filiform, erect, inserted in the middle of the base of the conceptacle. Conceptacle oblong, erect,  $\frac{1}{8}$  in. long, distinctly bordered and grooved down the face; basal teeth distinct. Sori 10-12.

Hab. Plains of Peninsular India, and discovered recently by Dr. I. B. Balfour in Socotra. Species 37-40 differ from all the other species by having pellucid streaks in the areolæ of the leaflets running down their long diameter.

38. *M. TRICHOPODA* Leprieur; A. Br. in Flora, 1839, 300. — Small, subterrestrial, wide-trailing, glabrous. Petiole 1-1 $\frac{1}{2}$  in. long; leaflets deltoid, about  $\frac{1}{4}$  in. long; outer edge rounded and entire. Pedicels solitary, very slender, ascending, about  $\frac{1}{2}$  in. long, inserted into the middle of the base of the erect or slightly oblique round-oblong distinctly-bordered conceptacle, which is 1-12th to 1-8th in. long, distinctly grooved across the faces, and furnished at the base with two obscure teeth. Sori 8-10.

Hab. Senegal, *Heudelot* 548! Very near the Asiatic *M. coromandelica*, from which it differs by its smaller conceptacles, broader in proportion to their length, and less distinct basal teeth.

39. *M. MUSCOIDES* Leprieur; A. Br. in Flora, 1839, 300. *M. microphylla* Welw. MSS. — Minute, subterrestrial, wide-trailing. Petiole very slender, 1-1 $\frac{1}{2}$  in. long; leaflets deltoid, glabrous,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long; outer edge rounded, entire. Pedicels solitary, erect, filiform,  $\frac{1}{3}$ - $\frac{1}{2}$  in. long, inserted into the middle of the base of the distinctly-bordered erect round-oblong glabrous conceptacle, which is distinctly grooved across the sides, and furnished at the base with two minute teeth. Sori 4-6.

Hab. Senegal, *Leprieur*. Angola, *Welwitsch* 109! 175! Closely allied to the two preceding species.

40. *M. DISTORTA* A. Br. in Berl. Monatber. 1863, 433. — Middle-sized. Leaflets deltoid, glabrous, crenulate on the outer edge. Pedicel 2 $\frac{1}{2}$ -3 times as long as the conceptacle, very shortly adnate to its base, solitary, slender, spreading or deflexed, flexuose, abruptly incurved at the tip. Conceptacle obovoid from a narrow base, little compressed, not margined, about  $\frac{1}{6}$  in. long, half as long again as broad, tomentose till maturity. Sori 12-14.

Hab. Senegal, *Lelievre*, *Leprieur*.

## 4. PILULARIA (Vaill.) Linn.\*

*Conceptacles* globose, coriaceous in texture, placed singly on short pedicels in the axils of the leaves, 2-4-celled, dehiscing at the tip into as many valves as there are cells, each cell (sorus A. Br.) furnished with a parietal placenta, from which arise numerous sacs with loose cellular membranous walls, the upper sacs representing microsporangia and each containing numerous microspores, the lower sacs representing macrosporangia and each containing a single macrospore.—Submerged inconspicuous plants, with wide-creeping slender rhizomes, with a leaf from the upper side, and a tuft of root-fibres from the lower side of each node. *Leaves* filiform, without any lamina, circinate in veneration, furnished, like the creeping stem, with several vascular bundles.

*Conceptacles* 2-celled.

Macrosporangia 1 in each cell . . . Sp. 1.

Macrosporangia many in each cell . . . Sp. 2.

*Conceptacles* 2-4, usually 3-celled . . . Sp. 3.

*Conceptacles* 4-celled . . . Sp. 4-6.

1. *P. MINUTA* Durieu; A. Br. in Berl. Monat. 1869, 435; Dextr. Sc. Alger. t. 38.—Rhizome and leaves much more slender than in *P. globulifera*, the latter 1-1½ in. long. Pedicels longer than the conceptacles, which are not more than ⅓ lin. diam., deflexed, 2-celled. Macrospores globose, not constricted, solitary in the cells.

Hab. South of France, Algeria, Sardinia, and Asia Minor.

2. *P. NOVÆ-ZELANDIÆ* Kirk in Trans. New Zeal. Instit. ix. 547, t. 29. — Rhizome and leaves more slender than in *P. globulifera*, the latter fewer and more distant 1½-2 in. long. Pedicels as long as the conceptacles, attached to the centre of their base. Conceptacles ⅓-½ in. diam. erect or subcernuous, 2-celled. Macrospores subglobose, not constricted, 10-12 to a cell.

Hab. New Zealand; hills of the southern island, Kirk 832! *Berggren*!

3. *P. AMERICANA* A. Br. in Berl. Monat. 1863, 435.—*P. valdiviana* Philippi. — Rhizome and leaves rather more slender than in *P. globulifera*, the latter 1-2 in. long. Pedicel short, arcuate. Conceptacle 2-4, usually 3-celled, 1-12th to 1-8th in. diam., erect. Macrospores subglobose, not constricted, 10-15 to a cell.

Hab. Arkansas, *Nuttall*! Near Santa Barbara, California, *Mrs. Cooper*. Valdivia, Chili, *Philippi*!

4. *P. NOVÆ-HOLLANDIÆ* A. Br. in Berl. Monat. 1863, 435. — Rhizome and leaves rather more slender than in *P. globulifera*, the latter 1½-2 in. long. Pedicel short, attached to one side of the deflexed conceptacle, which is ⅓ in. diam., 4-celled. Macrospores subglobose, not constricted, 20-25 to a cell.

Hab. Swan River, *Drummond* 991! Tasmania, *Gunn* 1561! South-east Australia, *Hannaford*.

\* See A. Braun in 'Monatberichte der Konigl. Akadamie der Wissenschaften in Berlin.' Oct. 1863 (translated into French Ann. Sc. Nat., Series vi., vol. i., p. 93), and Aug. 15, 1872.



5. *P. GLOBULIFERA* Linn. Sp. 1563; Valent. in Trans. Linn. Soc. xviii. t. 34; Hook. Brit. Ferns, t. 57.—Leaves usually 2-4 in. long. Pedicel very short, erect, attached to the centre of the base of the erect conceptacle, which is 4-celled,  $\frac{1}{8}$  in. diam. Macrospores ovoid, constricted above the middle, 15-20 to a cell.

Hab. Throughout Europe.

6. *P. MANDONI* A. Br. in Berl. Monat. 1862, 679. — Leaves rather flattened, 1-1 $\frac{1}{2}$  in. long,. Pedicel arcuate-ascending,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long, attached to the centre of the base of the 4-celled conceptacle, which is just like that of *P. globulifera*.

Hab. Andes of Bolivia, alpine region, at 16,000 ft. above sea-level, *Mandon* 1534!

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## KEY TO THE ORDERS AND GENERA.

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Series I. *ISOSPORIA*.—Spores all of one kind, falling to the ground and producing independent prothallia, on which are developed antheridia and archegonia.

Order I. *FILICES*.—Stems solid, producing leafy fronds with copious and often complicated venation. Sporangia usually arranged in clusters (sori) on the back or edge of leafy fronds, rarely in spikes or panicles. Spores without elaters. Vernation circinate.

Order II. *EQUISETACEÆ*.—Stems hollow, destitute of proper leaves; nodes distinct, each furnished with a short toothed sheath; branches, if present, usually verticillate. Sporangia placed on the underside of peltate scales, which form a cone at the end of the stem. Spores furnished with four long elaters, clubbed at the end. Vernation not circinate.

*EQUISETUM*.—The only genus. Page 1.

Order III. *LYCOPODIACEÆ*.—Stems solid, usually furnished with copious small leaves with simple veining. Sporangia solitary in the axils of ordinary or modified leaves. Spores without elaters. Vernation circinate.

\* *Acaulescent*.

1. *PHYLLOGLOSSUM*.—Leaves all in a radical rosette. Sporangia in a dense spike at the end of a leafless peduncle. Page 7.

\*\* *Caulescent*.

2. *LYCOPodium*.—Sporangia orbicular, compressed, 1-celled, 2-valved. Leaves small, crowded. Page 7.

3. *Tmesipteris*.—Sporangia boat-shaped, 2-celled, 2-valved. Leaves longer, less crowded. Page 29.

4. *Psilotum*.—Sporangia turbinate, 3-celled, 3-valved. Leaves distant, rudimentary. Page 30.



Series II. *HETEROSPORIA*. — Spores of two different kinds, macrospores and microspores, both developing rudimentary prothallia, which remain attached to the spore, those of the macrospores bearing archegonia and those of the microspores bearing antheridia containing antherozoids.

Order IV. *SELAGINELLACEÆ*. — Sporangia not enclosed in any exterior covering, placed singly in the axils of ordinary or modified leaves.

1. *SELAGINELLA*. — Terrestrial and caulescent. Sporangia dehiscent, free, collected in spikes of which the bracts are usually different from the proper leaves in shape and texture. Macrospores few in each macrosporangium. Page 31.

2. *ISOETES*. — Aquatic or subterrestrial, acaulescent. Sporangia not arranged in spikes but imbedded in the base of the long subulate leaves of a dense rosette. Macrospores very numerous in each macrosporangium. Page 123.

Order V. *RHIZOCARPEÆ*. — Sporangia enclosed in one or two exterior coverings (conceptacles).

Suborder I. *SALVINIÆ*. — Conceptacles membranous, indehiscent, containing only one kind of sporangium.

1. *SALVINIA*. — Leaves entire, with complicated anastomosing venation. Microsporangia free inside the conceptacle. Page 134.

2. *AZOLLA*. — Leaves small, bifid, simply veined, clasping a produced stem. Macrosporangia aggregated inside the conceptacle in massulæ with a membranous cuticle. Page 137.

Suborder II. *MARSILIEÆ*. — Conceptacles always double, the outer sac coriaceous and dehiscent, the inner membranous, indehiscent, containing sporangia of both kinds.

3. *MARSILEA*. — Conceptacles many-celled, dehiscing by the ventral suture. Leaf consisting of a petiole and 4 digitate cuneate leaflets. Page 138.

4. *PILULARIA*. — Conceptacles 2-4-celled, dehiscing at the tip by as many valves as there are cells. Leaf reduced to a filiform petiole. Page 148.

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